OLOGY DEPT.

Gas Journal

VOL. 288. 108th YEAR. LONDON, DECEMBER 5, 1956. No. 4873 PRICE 1/6

PUBLIC LIBRARY
DEC 19 1956

THOMAS GLOVER & Co Ltd

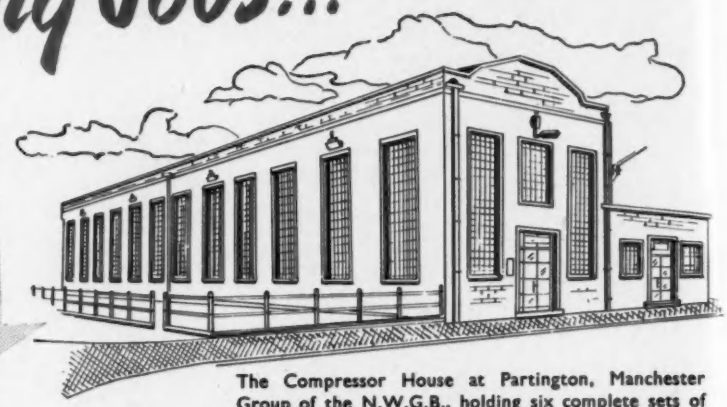
THOMAS GLOVER
& COMPANY LIMITED

Gothic Works, Angel Road, Edmonton, London, N.18 and Branches

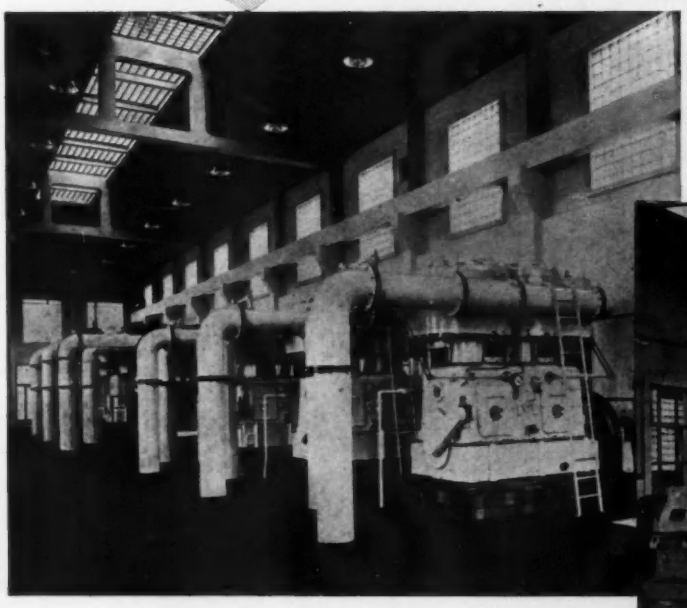
TGI

For the Big Jobs...

20,000,000 CUBIC FEET OF GAS PER DAY



The Compressor House at Partington, Manchester Group of the N.W.G.B., holding six complete sets of Gas Compressors. Each machine driven through speed reduction gear units arranged through gas tight wall glands



BASE YOUR DECISION ON APPLIED EXPERIENCE AND EFFICIENCY

Photographs by courtesy of N.W.G.B.

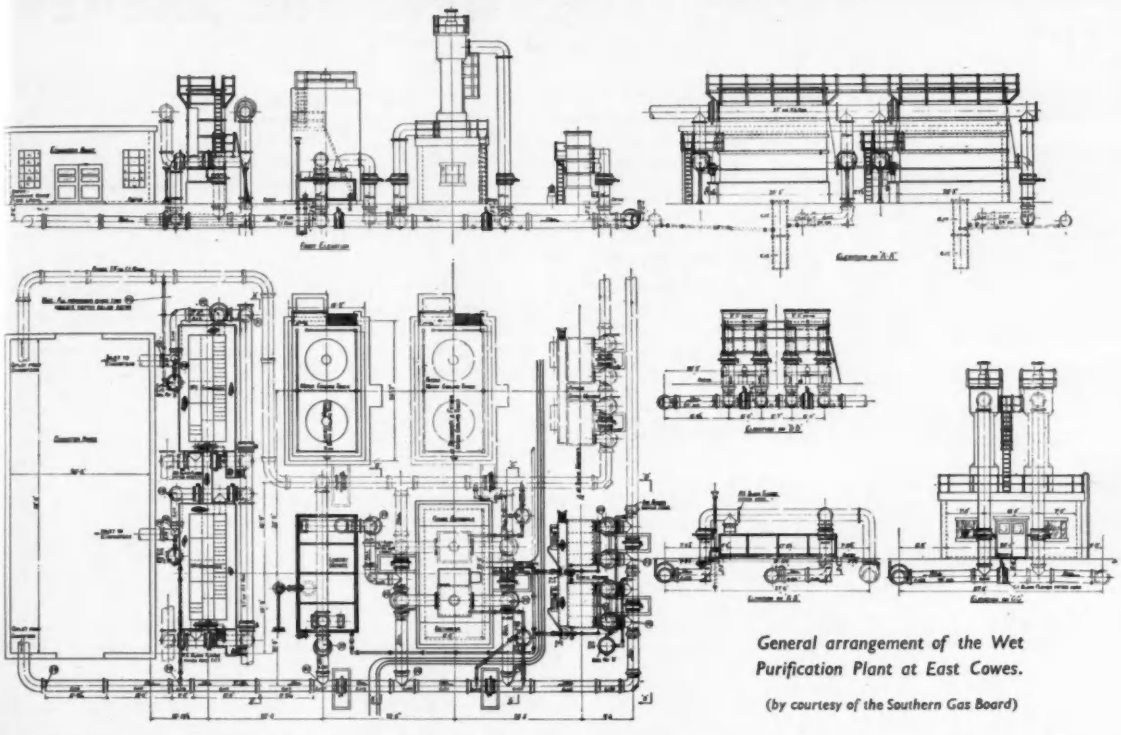
Illustrations show the interior of the Compressor House comprising:
3 – Gas Compressors – 22½" dia. x 12" stroke (2 variable speed and 1 constant speed), each capable of 160,000 cu. ft. per hour, running at 325 R.P.M. at 20 lbs. per sq. inch outlet pressure. 3 – 37" dia. x 14" stroke (2 variable speed and 1 constant speed), each capable of 500,000 cu. ft. per hour running at 290 R.P.M. at 10 lbs. per sq. inch outlet pressure
1 – Future machine 26½" dia. x 12" stroke (constant speed), 250,000 cu. ft. per hour running at 325 R.P.M. at 10 lbs. per sq. inch outlet pressure.

THE BRYAN DONKIN COMPANY LIMITED

CHESTERFIELD • LONDON • TORONTO

WET PURIFICATION PLANT

by DEMPSTERS of MANCHESTER



General arrangement of the Wet Purification Plant at East Cowes.

(by courtesy of the Southern Gas Board)

The Wet Purification Plant illustrated above comprises 2 Condensers, a Water-cooling Tower, Livesey and Static Washers, and an Electrostatic Detarrer.

We have long been experienced in the design, manufacture, and installation of the ancillary Plant used in the Gas Industry, and recent extensions in our Technical Departments and Works have vastly increased our scope. In consequence our activities extend into the Petroleum, Chemical, and Allied industries.

Our Works are well equipped and our available services include facilities for the stress-relieving of welded products, the thorough examination of welding by means of X-rays, and the use of isotopes for gamma ray testing where necessary.

R. & J.

DEMPSTER

LIMITED

Constructional Gas and Chemical Engineers

MAKERS OF HIGH QUALITY
BY-PRODUCT and CHEMICAL PLANT · CONDENSERS · CONNECTIONS and VALVES · DETARRERS · GASHOLDERS · IRON CASTINGS · PURIFIERS STILLS · TANKS · WASHERS · WELDED and RIVETED STEELWORK

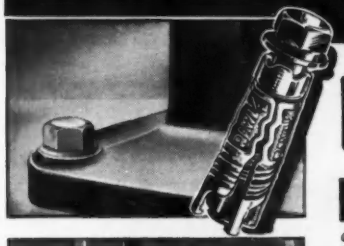
GAS PLANT WORKS · NEWTON HEATH

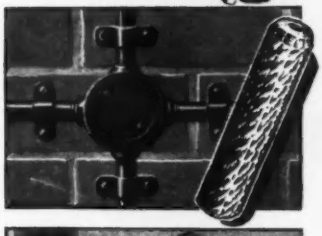
MANCHESTER 10

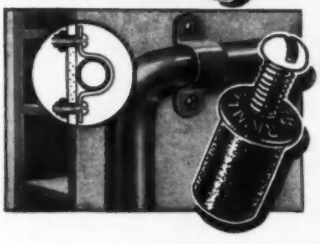
Telephone : COLlyhurst 2554, 5 & 6
Telegrams : "SCRUBBER, MANCHESTER 10"

London Office : 34 VICTORIA STREET, S.W.1
Telephone : ABBey 4426 Telegrams : "Scrubber, Sowest, London"

HAVE YOU A FIXING PROBLEM?

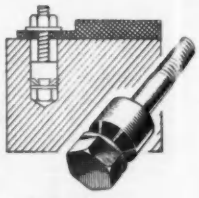




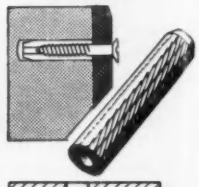


RAWLPLUGS HAVE THE ANSWER

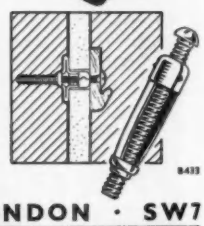
HEAVY FIXINGS Rawlplug expansion-grip bolt fixings *(no grouting, no waiting for cement to dry)* save so enormously in time and energy that they have superseded obsolete methods of bolting down machines and plant. Rawlbolts (left) — up to 1″ diam. — and Rawlplug Bolt Anchors (right) — up to 1¼″ diam. — require only minimum size holes, which are quickly drilled with special Rawlplug tools.



SCREW FIXINGS For every type of screw fixing in hard materials the famous Rawlplug is several times faster than any other method. You make neat holes, exact to size, with a Rawldrill or Durium (rotary) drill; insert a Rawlplug and turn home the screw. It's easy and straightforward —no mess, no 'making good' damage afterwards!



CAVITY FIXINGS Wherever the back of material is inaccessible, as in cavity bricks, wall boards, etc. Rawlplug Cavity Fixings overcome all difficulties. Left is the Rawlnut, which forms its own rivet head at the back as you tighten in front! Right is the Rawlanchor, which makes possible permanent tapped fixings in thin and hollow materials.



If you have a fixing problem, write full details to our Technical Dept. who will be delighted to advise you free.

THE RAWLPLUG COMPANY LIMITED · CROMWELL ROAD · LONDON · SW7

KIRKHAM, HULETT & CHANDLER LTD

UNION FOUNDRY, MANSFIELD, NOTTS.

TAR EXTRACTORS

PREHEATERS

PURIFIERS

WASHERS

CONDENSERS

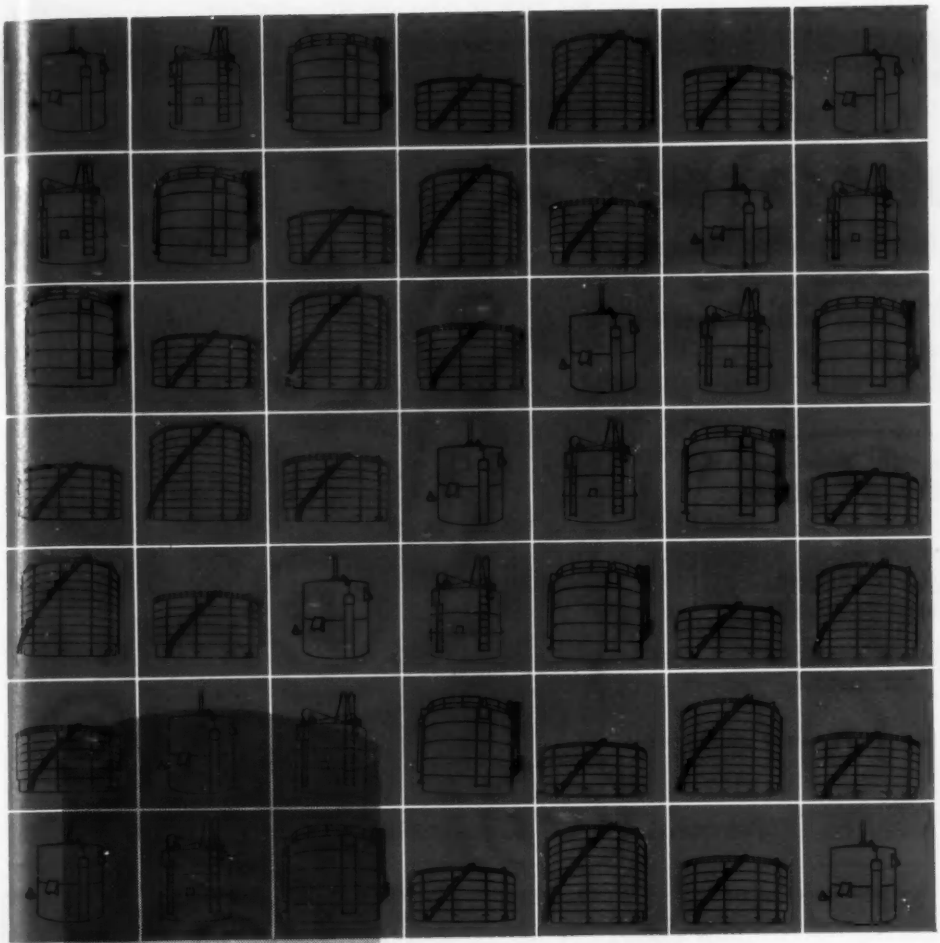
BENZOL PLANT

Tel: MANSFIELD 1256/7 Grams: CASTINGS MANSFIELD

LONDON OFFICE

Stafford House, Norfolk Street, Strand, W.C.2.

Phone: Temple Bar 9910 Grams: Washer, Estrand, London.



The Wiggins Dry Seal Gasholder

Since introducing the WIGGINS dry seal gasholder to Britain five years ago, fifty gasholders of this type have been ordered in sizes varying from 50 cubic feet to 500,000 cubic feet.

Many are already in use for the storage of a wide range of industrial gases. Because they deliver gas as received without any possibility of contamination WIGGINS gasholders are an ideal choice for the gas and chemical industries.

Wiggins ABP

THE FIFTIETH HAS JUST BEEN ORDERED

ASHMORE, BENSON, PEASE & CO

(MEMBER OF THE POWER-GAS GROUP)

STOCKTON-ON-TEES AND LONDON

AUSTRALIA CANADA · INDIA · FRANCE SOUTH AFRICA

246

Cochranes

Spun Iron Pipes & Flexible Joints

ALL COCHRANES SPUN IRON PIPES ARE WORKS HYDRAULICALLY PROOF TESTED TO 500 LB. PER SQUARE INCH

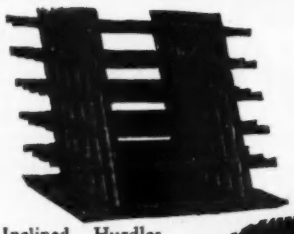
Screwed-Gland Flexible Joint : up to 10" dia.
Bolted-Gland Flexible Joint : 7" and above

Cochranes (Middlesbro') Foundry Limited, Middlesbrough

CROSSLEY GRIDS

for

PURIFIERS, SCRUBBERS AND WASHERS



Inclined Hurdles (Light or Heavy Type) with Bottom Flat Grids.

Scrubber Grids.

Open Space Grids or Upper Tiers.

Patent Double-Barred Grids.

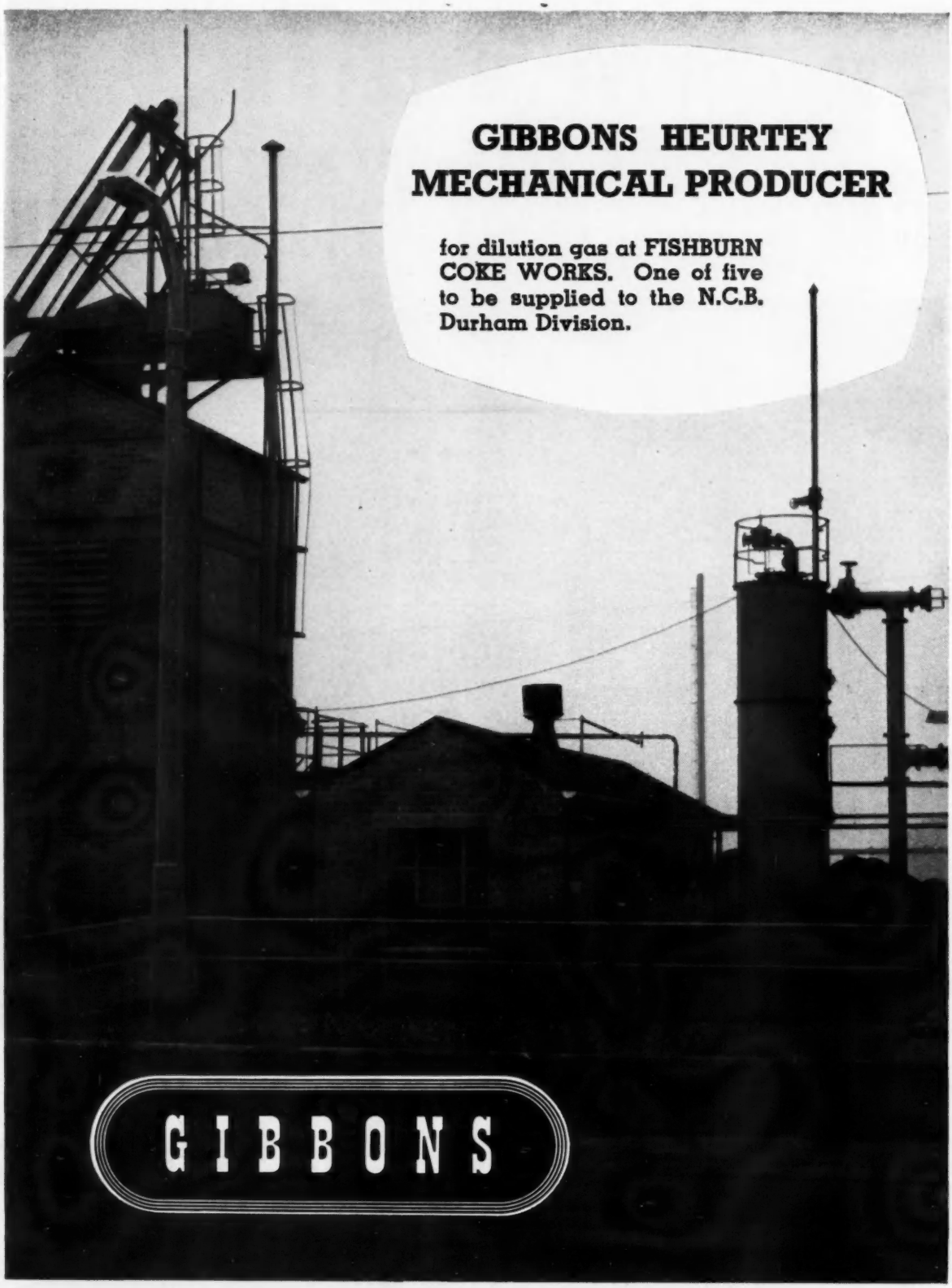
Flat Grids for Bottom Tiers (Closed Ends).

Embody the latest improvements—are of the very best quality—and are in use extensively throughout the Kingdom.

Send your enquiries for any kind of Grids to :—

CROSSLEY BROTHERS,
GRID WORKS, BISPHAM, BLACKPOOL.

Telephone : BLACKPOOL 51005 (2 lines). ***Telegrams :*** "WOODWARE, BLACKPOOL."

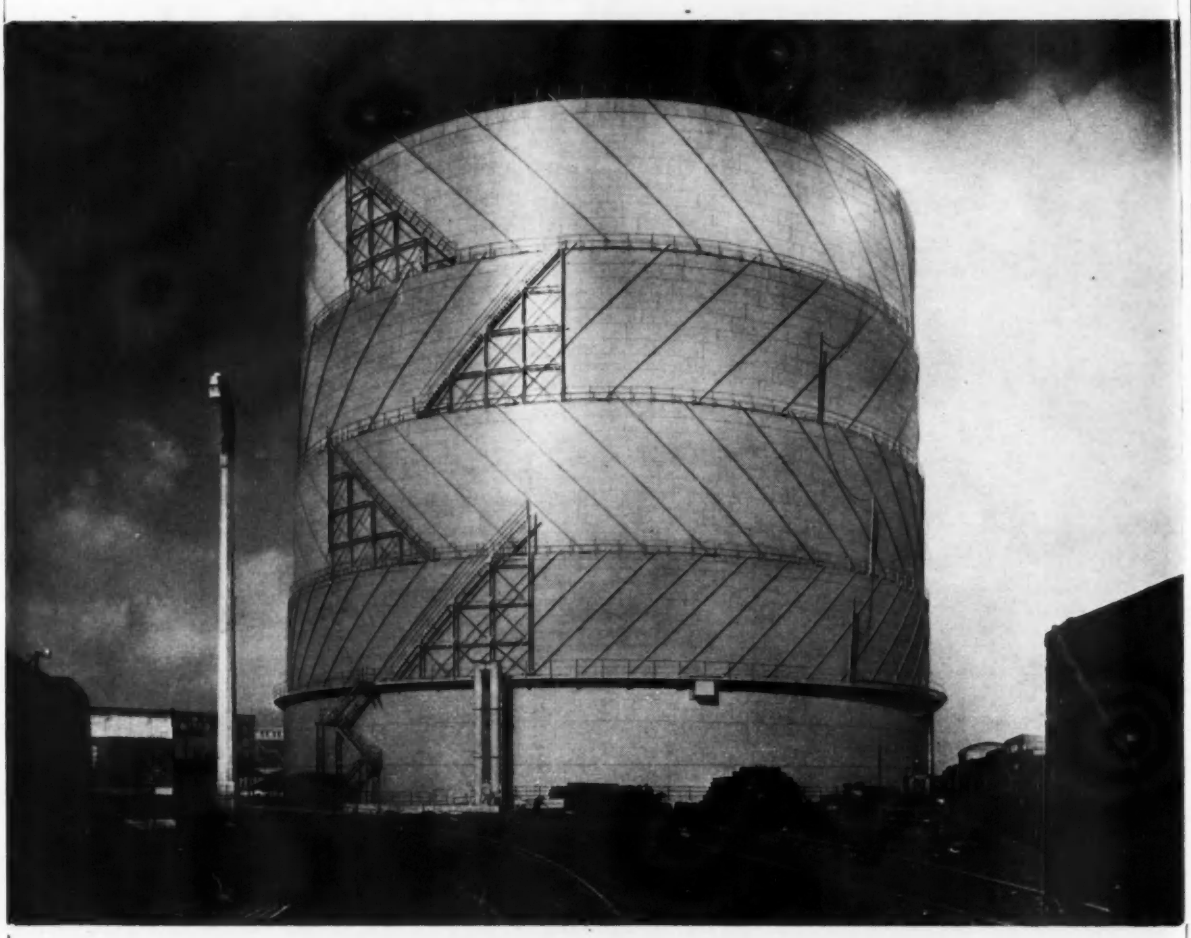

GIBBONS HEURTEY
MECHANICAL PRODUCER
for dilution gas at FISHBURN COKE WORKS. One of five to be supplied to the N.C.B. Durham Division.
GIBBONS

GIBBONS HEURTEY LIMITED, P. O. BOX 19, DIBDALE, DUDLEY, WORCS.
TEL.: DUDLEY 3141

FIVE MILLION

CUBIC FEET CAPACITY

GASHOLDER and STEEL TANK

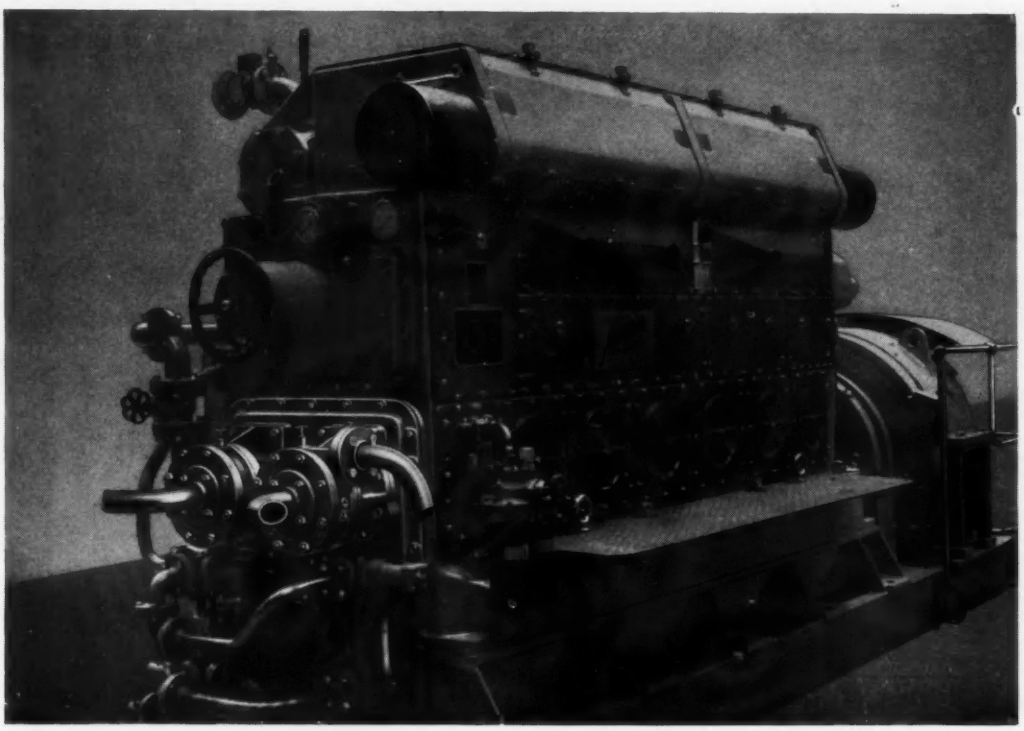


COMPLETED MAY 1953 AT

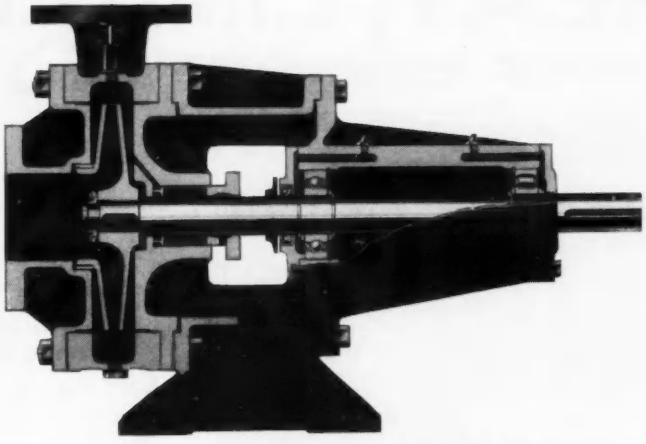
SWAN VILLAGE GASWORKS

BIRMINGHAM DIVISION, WEST MIDLANDS GAS BOARD

CLAYTON SON & CO. LTD.
HUNSLET LEEDS YORKSHIRE



For the efficient pumping of cooling water these Mirrlees engines are fitted with



SAFRAN Bare Shaft Pump from which the Mirrlees adaptation is derived. Belt, motor and engine driven sets are included in the standard range.

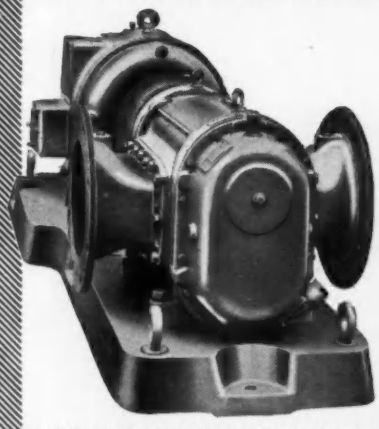
SAFRAN
REGISTERED TRADE MARK
PUMPS

SAFRAN, in standard or adapted form, will solve your pumping problems. Literature explains the wide standard range. Suggested adaptations to suit your quantity requirements on application.

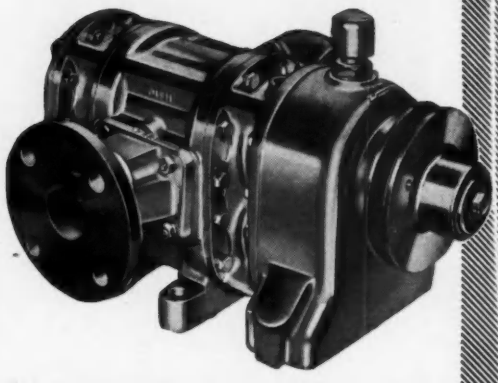
SAUNDERS VALVE COMPANY LIMITED

SAFRAN PUMP DIVISION

DRAYTON STREET : WOLVERHAMPTON



oil free GAS boosting



GODFREY
SIR GEORGE GODFREY & PARTNERS (IND.) LTD.

Godfrey gas boosters are suitable for handling most commercially used gases including town's gas .... positive sealing ensures freedom from oil contamination.

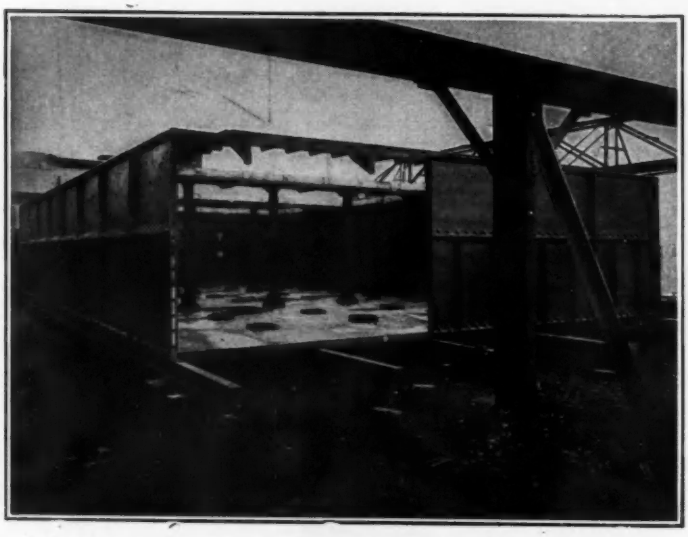
SIR GEORGE GODFREY & PARTNERS (Industrial) LTD HANWORTH, MIDDLESEX
TELEPHONE: FELTHAM 3291 · CABLES: GODFREPART, LONDON

ASSOCIATED COMPANIES IN CANADA, AUSTRALIA & SOUTH AFRICA

E. C. & J. KEAY, LIMITED

CONSTRUCTIONAL ENGINEERS AND IRONFOUNDERS

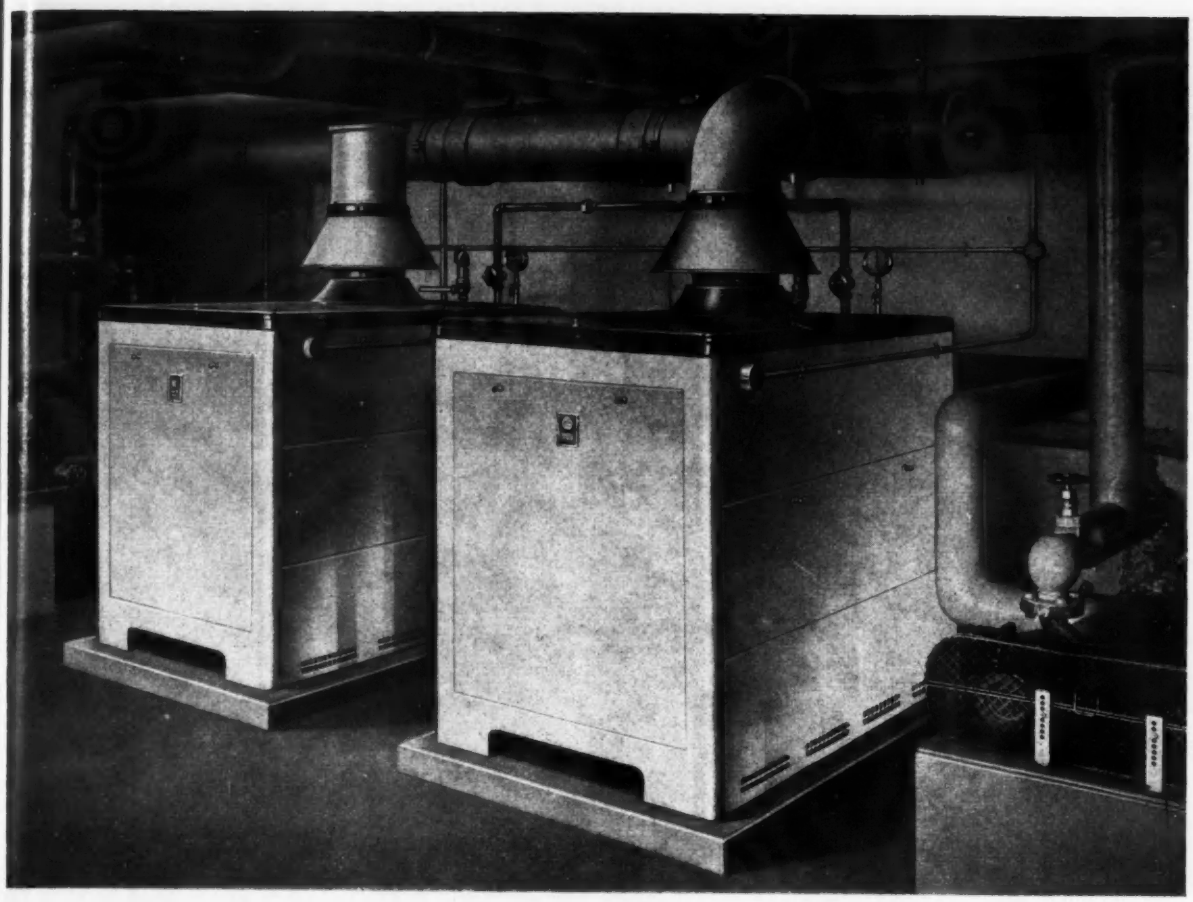
Head Office:
"Runnymede,"
Stratford Road,
Henley-in-Arden,
Warwickshire



Cast Iron Purifiers temporarily erected in our Works prior to despatch

Also Offices at
LONDON
SOUTHAMPTON

Specialists in Tanks, Steel or Cast-Iron, Riveted or Welded, etc.
JAMES BRIDGE WORKS, DARLASTON



Cleanliness and Efficiency

IDEAL Gas Boilers

Illustrated above are Ideal Gas Boilers installed, for central heating and indirect hot water supply, in the recently completed extension to a hospital.

Cleanliness and a healthy atmosphere are essential to a hospital, and it is therefore important that the heating boilers are fired with a smokeless fuel. In such circumstances, no better choice can be made than Ideal gas-fired boilers. Many years of research work and experience have resulted in the present satisfactory designs.

Ideal Gas Boilers are equipped with complete thermostatic controls, have insulated jackets of steel or aluminium in appropriate finishes and are available in 22 sizes from 20,000 to 1,430,000 B.T.U.'s per hour.

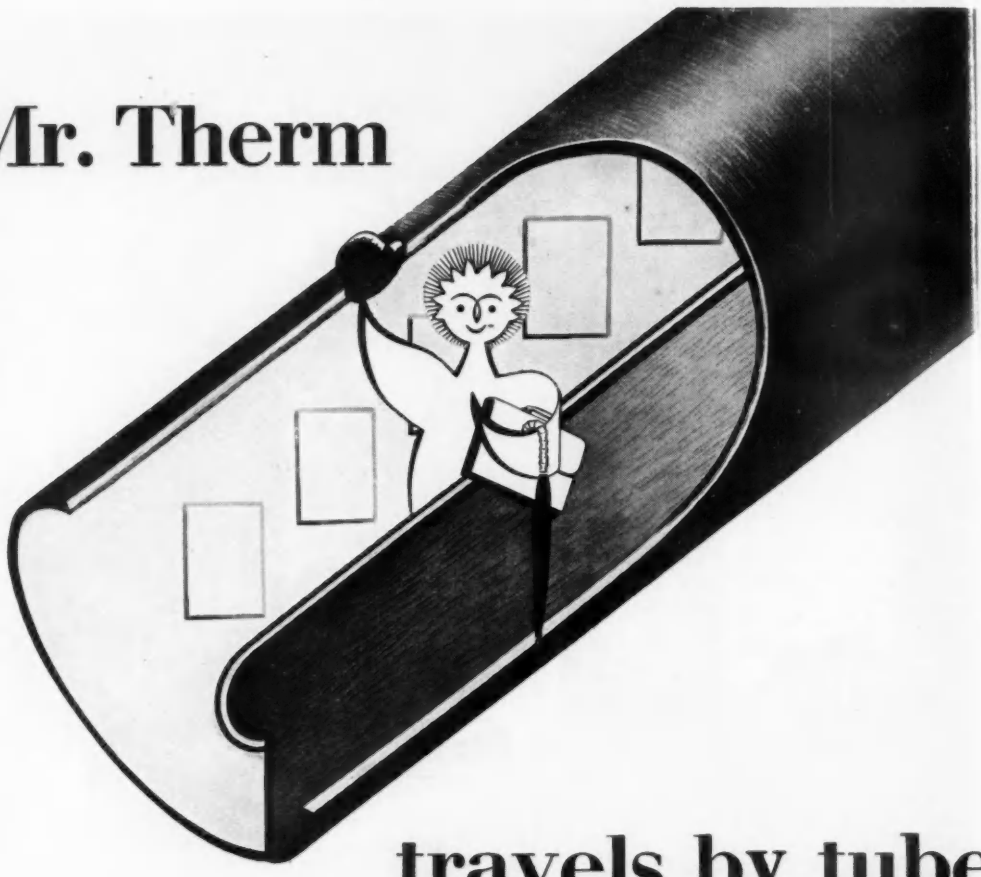
IDEAL-Standard

Foremost for heating and sanitary equipment

IDEAL BOILERS & RADIATORS LIMITED · IDEAL WORKS · HULL

333

Mr. Therm



travels by tube

The gay little figure of Mr. Therm has been the popular symbol of gas ever since the 1930's. He is now an established figure throughout the country, standing for the Progress of Gas.

As part of this progress, the gas industry is increasingly using I.C.I. copper tubes and I.C.I. tube fittings, which have won wide acceptance on account of their reliability and consistent conformity to a rigorous specification — ensured by the latest methods of production and inspection.

For the home or the factory, the office or the school — right from mains to supply point — wherever there's gas, Mr. Therm and I.C.I. copper tubes are ideal partners.

I.C.I. COPPER TUBES AND FITTINGS

INCLUDING *'Kuterlon', 'Intex P.T.', 'Instantor', 'Kuterlite'*

ICI

METALS DIVISION

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

M371

REF. No. IND/FB/89

HUWOOD Conveyors

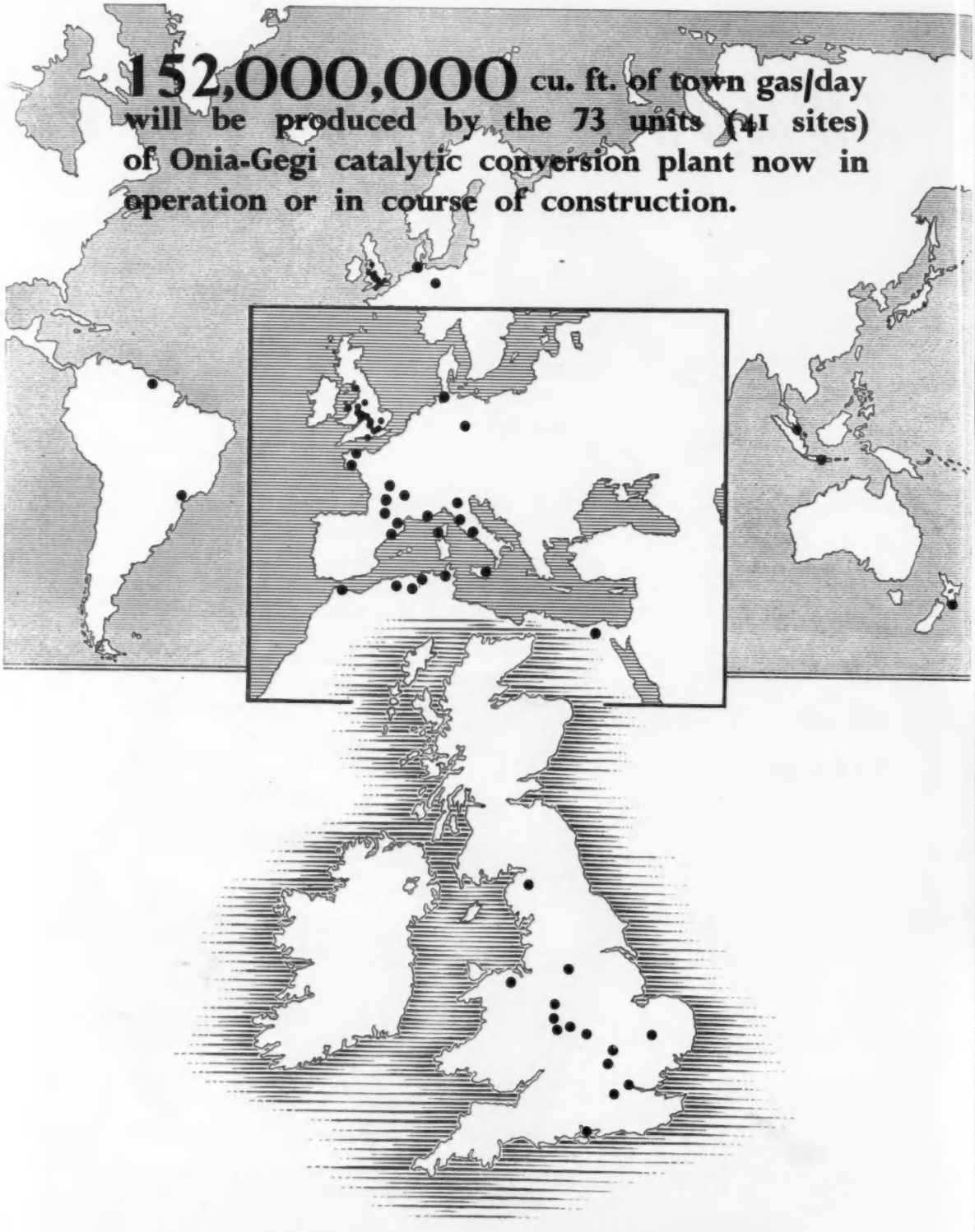
HUWOOD

In growing demand in the GAS and allied Industries

The best form of short distance transport

HUGH WOOD & CO., LTD., GATESHEAD-ON-TYNE, 11.

152,000,000 cu. ft. of town gas/day will be produced by the 73 units (41 sites) of Onia-Gegi catalytic conversion plant now in operation or in course of construction.



HUMPHREYS & GLASGOW LTD

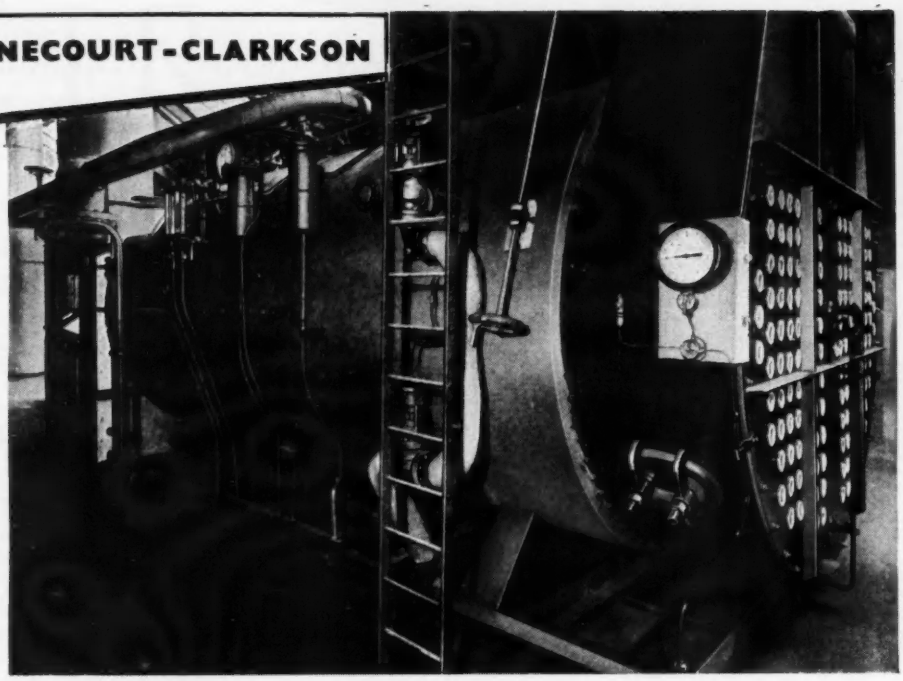
HUMGLAS HOUSE · CARLISLE PLACE · LONDON S.W.1

Telephone: VICtoria 8454

AUSTRALIAN OFFICE: BERGER HOUSE · 81 ELIZABETH STREET · SYDNEY · N.S.W.

SPENCER-BONECOURT-CLARKSON
LIMITED

SPECIALISTS IN WASTE HEAT RECOVERY PLANT

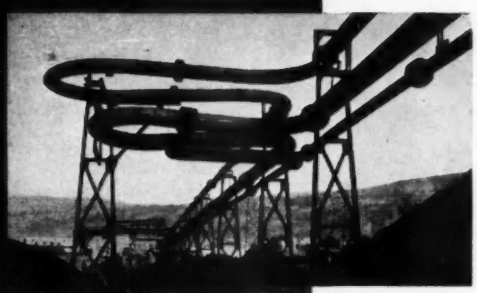


The illustration shows one of the Spencer-Bonecourt waste-heat boilers at Stoke-on-Trent Gas Works. Similar units are installed on all the Glover-West Continuous Vertical carbonising plant in this works.

LYNTON HOUSE, 7-12 TAVISTOCK SQUARE, LONDON W.C.1.

Telephone : EUSton 4321
Telegrams : HEATECON, PHONE, LONDON

THE **UNIT** SUPERHEATER AND PIPE COMPANY LTD



FABRICATORS OF :– Pipework for high or low pressures suitable for steam, water, gas etc.

Water wall headers, Steam and oil receivers, De-Superheater bodies.

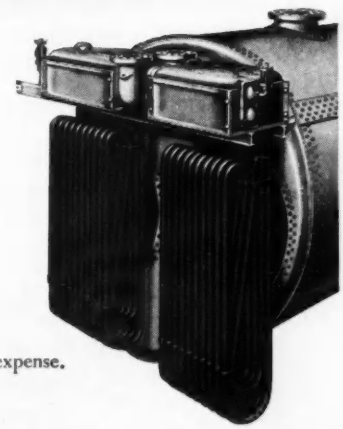
Tubular products of all descriptions for power stations and industrial steam raising plants.

As pioneers in Superheat application we build into our Unit Superheaters the accumulative experience gained over 40 years of close specialization.

The basic advantages of this application are many and well-known, and the resultant fuel economy well established.

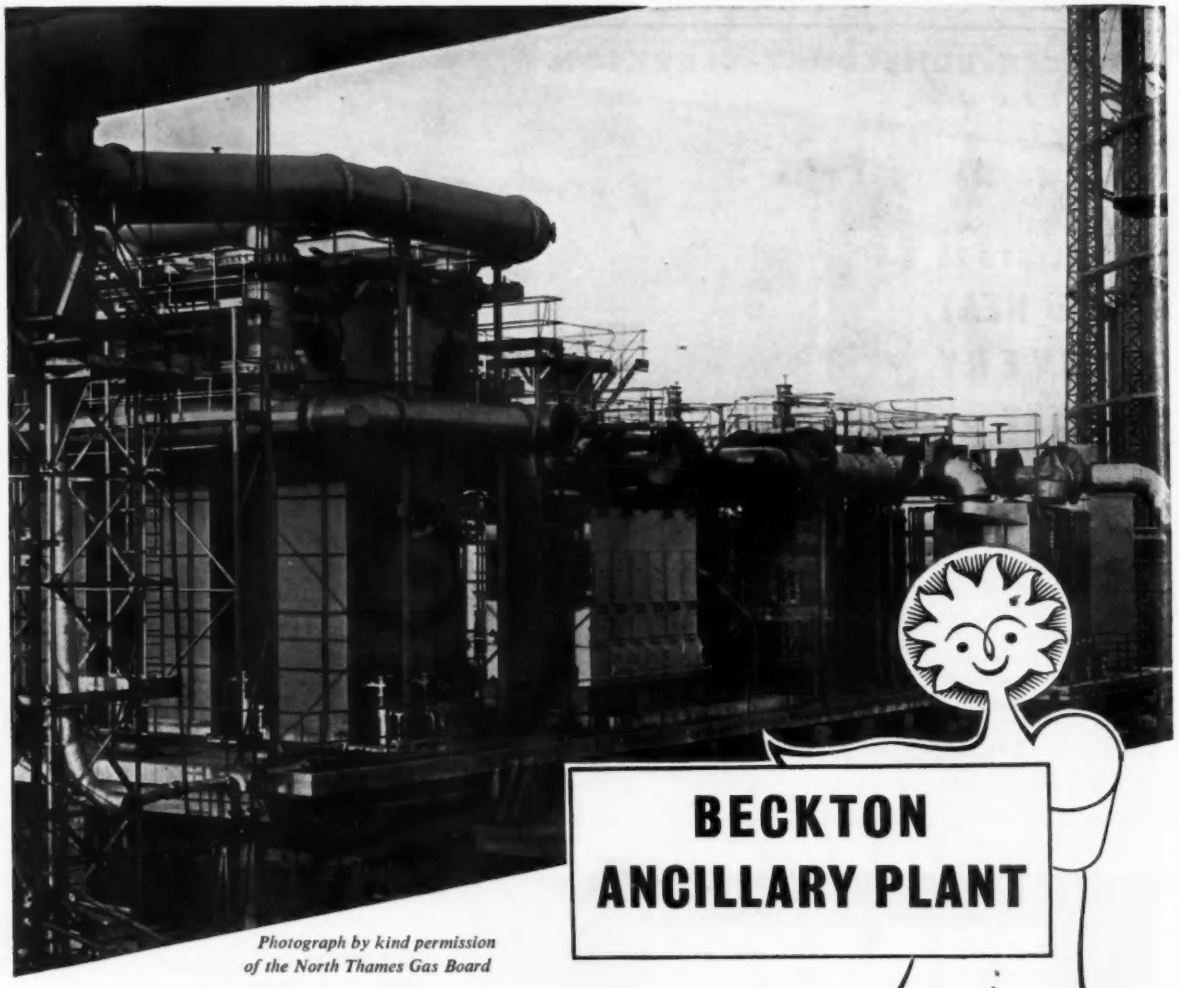
Automatic temperature control of steam within plus or minus 2/5°F. can be readily obtained, adjustable for winter and summer conditions as required.

These advantages are possible by utilizing, re-circulating and flashing to steam, existing condensate water. The Unit system accomplishes more with less expense.



Radiographic services available for inspection and tests.
Expert operators accustomed to welding alloy and other steels for modern high pressure and high temperature steam conditions.

UNIT WORKS, SWANSEA *Telephone: Swansea 4091 (6 lines) Telegrams: 'Superunits', Swansea*



Photograph by kind permission of the North Thames Gas Board

BECKTON ANCILLARY PLANT

THE PLANT illustrated is capable of handling 8 million cu. ft. of coke oven gas per day, and provides primary cooling, electrostatic tar removal, naphthalene extraction, secondary cooling, and ammonia washing. The installation is complete with liquor and tar storage tanks, liquor treating plant and all the necessary circulating pumps.

Balfour OF LEVEN

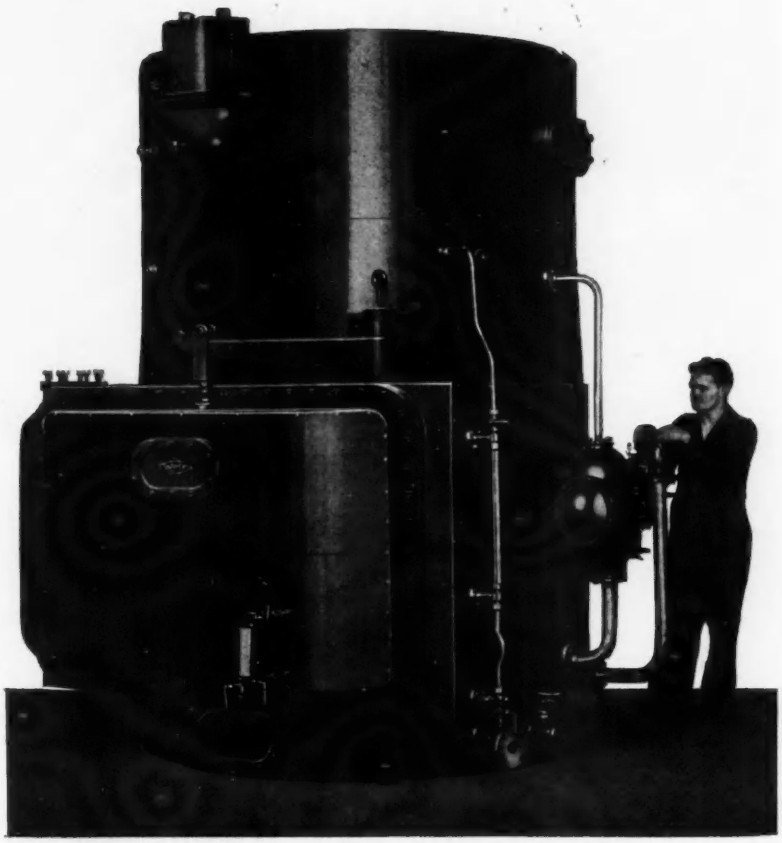
HENRY BALFOUR & COMPANY LIMITED

Artillery House, Artillery Row, Westminster, London & Durie Foundry, Leven, Fife

A MEMBER OF THE BALFOUR GROUP OF COMPANIES

Blo: 9

WEIR
EVAPORATORS



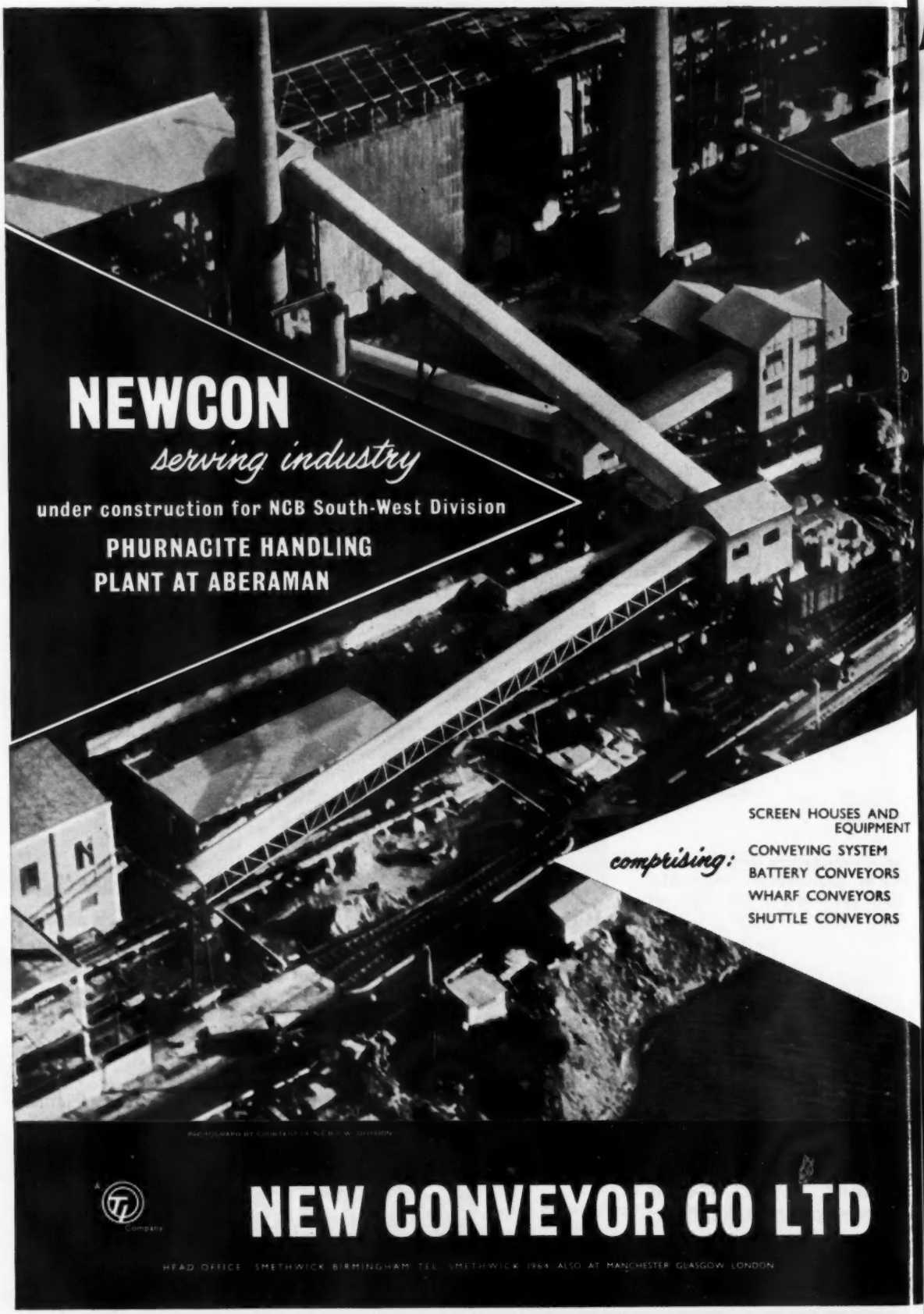
Weir Evaporators are made in single or multi-stage, horizontal or vertical designs for high or low pressure.

High pressure boilers demand pure feed make-up as an absolute necessity. Apart from the prevention of tube failures, high boiler and turbine efficiencies can be maintained, fuel consumption minimised, blow-down heat loss obviated, and stoppages for cleaning rendered unnecessary.

Write for Publication No. GK. 151,
"Weir Evaporating and Distilling Plants."

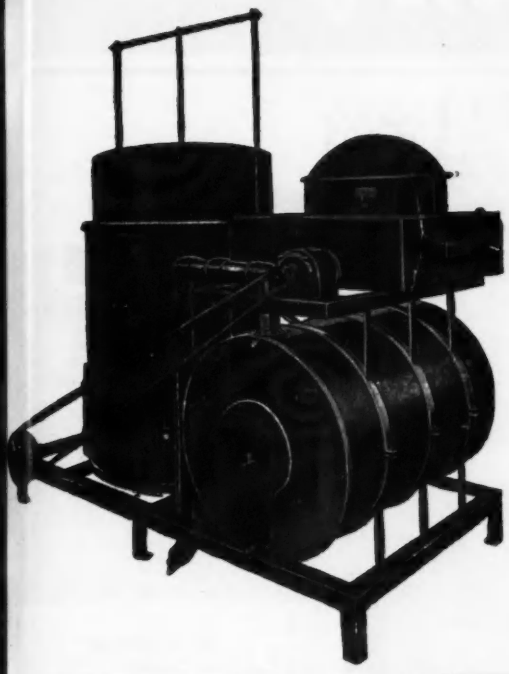
FEED PUMPS · FEED HEATERS
AIR PUMPS · DE-AERATORS
FEED REGULATORS

G. & J. WEIR LTD
CATHCART · GLASGOW


NEWCON
serving industry
under construction for NCB South-West Division
PHURNACITE HANDLING
PLANT AT ABERAMAN
comprising:
SCREEN HOUSES AND EQUIPMENT
CONVEYING SYSTEM
BATTERY CONVEYORS
WHARF CONVEYORS
SHUTTLE CONVEYORS
NEW CONVEYOR CO LTD
HEAD OFFICE SMETHWICK BIRMINGHAM TEL SMETHWICK 1964 ALSO AT MANCHESTER GLASGOW LONDON

AEROGEN GAS GENERATORS

(300 B.T.U's per cubic foot)



Single unit capacities range from 100 to 15,000 cu. ft. of Petrol Air Gas supply per hour. One gallon of petrol produces 500 cu. ft.

The Ideal fool-proof system in commission in thousands of laboratories, industrial processing works, etc., at home and abroad where Town's Gas Supply is not readily available.

Conventional Appliances are easily adapted to coal gas burner performance.

Full technical information obtainable from the makers :

THE AEROGEN COMPANY LTD.
ANSTEY MILL LANE WORKS,
ALTON, HAMPSHIRE, ENGLAND
(Established over half a century)

Telegrams : Aerogen, Alton, Hants. *Telephone : Alton 208*

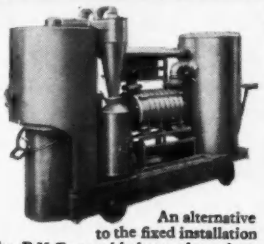
DUST
and
HOT ASH
REMOVAL
by

B.V.C
BRITISH VACUUM CLEANER

INSTALLATION

The illustration shows a typical B.V.C. installation in operation. Cleaning hoses can be coupled to installed piping throughout the works and all dust and ash collected at a central station for disposal. Hot ash can be handled and special non-choking tools are supplied to handle large volumes of ash.

Please write for particulars
THE BRITISH VACUUM CLEANER & ENGINEERING CO. LTD
Dept. 63, Goblin Works, Leatherhead, Surrey



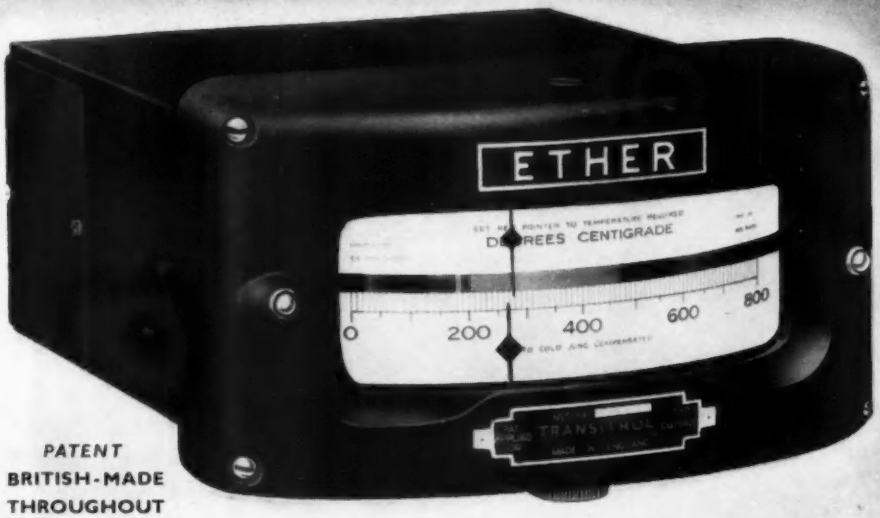
An alternative to the fixed installation is the B.V.C. portable heavy duty plant.

Completely New!

ETHER LIMITED

TRANSITROL

INDICATING TEMPERATURE-CONTROLLERS
SERIES 900



PATENT
BRITISH-MADE THROUGHOUT

This unique wide-range direct-deflection instrument indicates and controls temperature accurately . . . it costs considerably less than conventional electronic controllers . . . and, furthermore, outclasses all electronic controllers in accuracy, simplicity and reliability . . . fully described in our new TRANSITROL data-leaflet available on request.

NO THERMIONIC VALVES
★
NO WARM-UP TIME
★
PRECISION CONTROL
★
8¾" x 4⅜" PANEL CUT-OUT

★

Type 990 Two-position (on/off) **CONTROLLER**
£35-10-0
★
Type 991 Anticipatory **CONTROLLER**
£40-15-0
★
Type 992 Proportioning (stepless) **CONTROLLER**
(including pilot amplifier and saturable reactor)
from £85-0-0
★
Immediate Delivery

ENQUIRIES, SALES AND SERVICE:

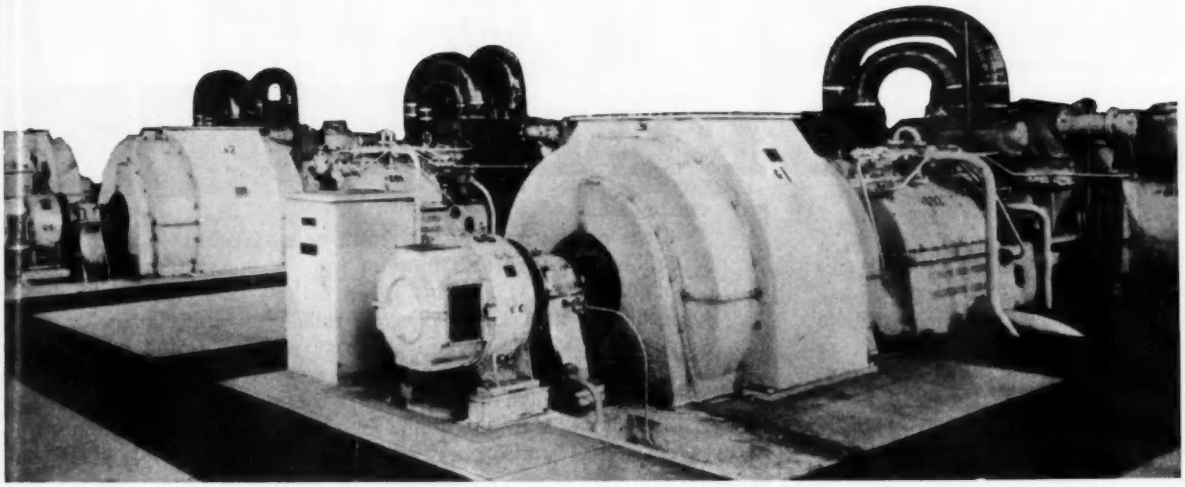
MIDLAND COUNTIES: ETHER LTD.
Tyburn Road, Erdington, Birmingham, 24 : East 0276/7/8

SOUTHERN COUNTIES: ETHER LTD.
Caxton Way, Stevenage, Herts.: Stevenage 780/1/2

NORTHERN COUNTIES: V. L. FARTHING & CO. LTD.
329 Tower Building, Water Street, Liverpool, 3 : Central 9626
Waterloo Buildings, 10 Piccadilly, Manchester, 1 : Central 3539

ETHER LIMITED

PROCESS STEAM DOES DOUBLE DUTY



with Metropolitan-Vickers Turbo-Generators

Three 3750 kW pass-out turbo-generators have been built by Metropolitan-Vickers for British Enka Ltd.

By adopting Metropolitan-Vickers pass-out turbo-generator sets, many industrial organisations using steam for processes or heating have found it economical to generate electrical power at little additional fuel cost. The company produces condensing and pass-out turbo-sets from 250 to 5000 kW AC or DC. These small power sets have been adopted in paper mills, plastics manufacture, textile production, public utilities, chemical and oil plants throughout the world. Please write for publication 7452/1.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER 17

Member of the A.E.I. group of companies.

Self-contained Turbo-generator Sets

B/L 204

STILLITE INTRODUCE "SR5"
New Product Sets New Standard of Insulation Economy

...and now

Another new Stillite Product increasing insulating efficiency and cutting costs.

AEROFELT SM3

- Density 3 lbs per cu. ft.
- Made in 6 yd rolls in a variety of widths and thicknesses.
- Easily cut to shape with knife or scissors.
- Fireproof, non corrosive, inorganic.
- Non-irritant, vermin- and bacteria-proof.
- Water repellent, non-settling and harmless to handle.
- Low cost.

Close on the heels of the recent announcement of SR5 the new Stillite semi-rigid slab form of insulation comes the introduction of Aerofelt SM3. This is an entirely new lightweight flexible insulating material supplied in roll form, either plain or paper covered SM3 is exceptionally easy to handle, and because it is made from longer fibred mineral wool, it has improved cohesive strength and high resilience. But, most important of all, AEROFELT SM3 is not only more efficient than other insulants of the same density—it is also cheaper.

STILLITE

STILLITE PRODUCTS LIMITED. 15 WHITEHALL, LONDON, S.W.I. Telephone: WHItehall 0922

THOMAS BAYLEY (GREAT BRIDGE) LTD.
BAGNALL STREET, GREAT BRIDGE, STAFFS.
Telephone: 1587 Tipton
Manufacturers of Best Staffordshire Blue, Brown and Red Engineering Bricks
Blue pressed and Wirecut Paviors for Hopper Linings and Retort House Floors

J. BROWN & CO. LTD.
SAVILE TOWN, DEWSBURY, YORKS.
Supply:-
"BROWNOX-de-LUXE" PURIFYING MATERIAL
Purchase:-
SPENT OXIDE

THOMAS BUGDEN & CO
India-Rubber and Airproof Manufacturers and General Contractors.
LARGEST MANUFACTURERS OF GAS MAIN BAGS.
Telegrams—"AIRPROOF, BARB, LONDON." Telephone—6147 CLERKENWELL
Contractors to H.M. Government

Gas Bags for Repairing Mains
PATENTEES OF THE
DENMAR BAG
Impervious to Main Liquor and Climatic Influences.

Round or Cylinder Shape.

Full-through and Expanding MAIN STOPPERS.
All types of INDIA-RUBBER BOOTS.
DRAIN RODS AND WHALE-BONE BRUSHES.
HOSE AND TUBING FOR ALL PURPOSES.

Stokers' Mitts and Gloves of every description.
Contractors' & Miners' Woollen Jackets, Trousers, Hats, &c. **244, Goswell Road, LONDON, E.C.1.**

UNDERPRESSURE ENGINEERING CO., LTD.
UNDERPRESSURE CONNECTIONS
SPLIT COLLARS
SOCKET CLIPS
UNION FOUNDRY, MANSFIELD, NOTTS.
ALL TYPES OF DISTRIBUTION MATERIAL IN STOCK
Service Enquiries:
STAFFORD HOUSE, NORFOLK STREET, STRAND, W.C.2.
'Phone: MANSFIELD 1256. *'Grams:* CASTINGS, MANSFIELD.
'Phone: TEMPLE BAR 9910. *'Grams:* WASHER, ESTRAND, LONDON
CENTRAL ACTION DRILL STANDS
SERVICE CLEANSERS
TOOLS, ETC.

FIG. 77

THESE are Abbirko force pumps

FIG. 35C

Fig. 77 is the single stage pattern and has the advantage of simplicity and complete reliability. All brass.

Fig. 35c is the improved two stage pattern and will attain 300 lbs. pressure. All brass. The best of its kind, fitted with instantaneous Release Cock.

Write for full particulars and prices

ABBOTT, BIRKS & CO LTD 90-91 BLACKFRIARS ROAD, LONDON, S.E.1

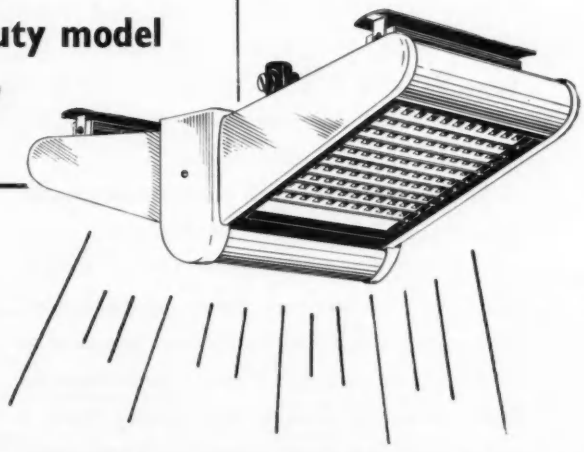
TOOLS AND EQUIPMENT FOR THE GAS INDUSTRY

P3341

★ **BRATT COLBRAN** *Pioneers of Industrial Overhead Radiant Gas Heating*

Introduce this New Heavy-duty model

The 'SATELLITE'



A DOWNWARD RADIATING HEATER FITTED WITH NON-AERATED BURNER

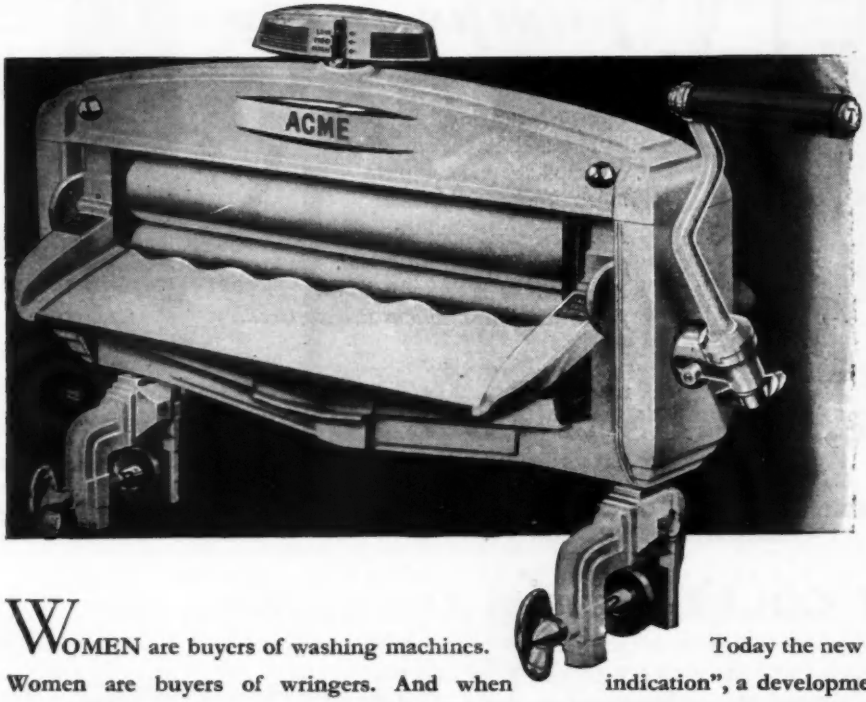
BRATT COLBRAN, foremost in the field of overhead space heating, clearly justify their leadership by introducing the SATELLITE heavy duty model.

Large buildings, even structures not completely closed in on all sides, can now be adequately heated by the overhead method using the SATELLITE. No cold spots due to floor level obstructions, no temperature variations such as can occur when heat is piped a lengthy distance, but an equal degree of warmth when and where you want it. The non-aerated burner gives increased flame stability and reduces maintenance to a mere annual inspection.

WE SHALL BE GLAD TO SEND FULL DETAILS

BRATT COLBRAN LIMITED, LANCELOT RD., WEMBLEY, MIDDLESEX. *'Phone WEMbley 6221.*

When washing machines are Acme-fitted **then** women know they're buying the best . . .



WOMEN are buyers of washing machines. Women are buyers of wringers. And when women think of wringers they think of the Acme. So when your machines are Acme-fitted your customers know that they must be, like the Acme, the best on the market.

Seventy years of good, solid British manufacturing, skill, research, and experience stand behind each Acme—and generations of women know this to be true. Acme is the perfect expression of real and continuous progress in the history of wringing. Thus, every feature for which Acme is famous, has sprung from a known need; has been tested, tried and found successful before it leaves the factory.

Today the new Acme has "pressure indication", a development which, by assuring the correct pressure for every kind of fabric, takes the guesswork out of wringing. Silks, cottons, woollens, linens, now receive exactly the right pressure needed to extract water, expel embedded dirt and preserve the life of each fabric. Thus wringing is made simpler and easier.

Acme does a better job, lasts longer and gives the best results. That's why Acme's reputation is world wide. That's why more than four million women have chosen an Acme in preference to all others. That's why, when your washing machines are Acme-fitted, women know they're buying the best.

ACME WRINGERS LIMITED DAVID STREET GLASGOW SE

INDEX TO 'JOURNAL' ADVERTISERS

A

	PAGE
A.C.E. Machinery, Ltd.	
Abbott, Birks & Co., Ltd.	581
Acme Wringers, Ltd.	582
Aerogen Co., Ltd.	577
Air Control Installations, Ltd.	
Aldis & Mackay, Ltd.	
Aldridge & Ranken, Ltd.	
Allan Taylor (Engineers), Ltd.	
Ascot Gas Water Heaters, Ltd.	
Ascot Gas Water Heaters, Ltd. (F. A. Neat)	
Ashmore, Benson, Pease & Co.	563
Ashworth & Parker, Ltd.	
Aspinall's (Paints), Ltd.	
Associated Lead Manufacturers, Ltd.	
Atlas Preservative Co., Ltd.	
Audley Engineering Co., Ltd.	
Automatic Telephone & Electric Co., Ltd.	
Automotive Products, Ltd.	

B

Bale & Church, Ltd.	613
Balfour, Henry, & Co., Ltd.	574
Bayley, Thos., (Great Bridge), Ltd.	580
Begnisco Meters, Ltd.	
Blakeley, Firth, Sons & Co., Ltd.	
Bolton's Superheater & Pipe Works, Ltd.	
Brattle Colbran, Ltd.	581
Bray, George, & Co., Ltd.	
Bray, W. E., & Co., Ltd.	
Bristol Pneumatic Tools Ltd.,	
British Carbo-Norit Union, Ltd.	
British Gas Purifying Materials Co.	
British Jeffrey-Diamond, Ltd.	
British Oxygen Co., Ltd.	
British Paints, Ltd.	
British Rototherm Co., Ltd.	
British Thermostat Co., Ltd.	
British Thomson Houston, Ltd.	
British Tyre & Rubber Co., Ltd.	
British Vacuum Cleaner & Engineering Co., Ltd.	577
Broadbent, Thomas, & Sons, Ltd.	
Broom & Wade, Ltd.	
Brown, J., & Co., Ltd.	580
Bugden, Thos., & Co.	580

C

Cambridge Instrument Co., Ltd.	
Cannon (G.A.) Ltd.	
Cathodic Corrosion Control, Ltd.	
Causeway Reinforcement Ltd.	
Cementation Co., Ltd.	
Cheltenham Meters, Ltd.	
Chemical Engineering Wiltons, Ltd.	
Cinema-Television, Ltd.	
Clapham Bros., Ltd.	
Clayton, Son & Co., Ltd.	566
Clensol Ltd.	
Clifford Engineering Co., Ltd.	611
Cochrane (Middlesbro') Foundry, Ltd.	564
Cohen, George, Sons & Co., Ltd.	
Concrete Proofing Co., Ltd.	
Consett Iron Co., Ltd.	
Cort, Robert, & Son, Ltd.	
Crane, Ltd.	
Crone & Taylor, Ltd.	
Crosby & Co., Ltd.	
Cressley Bros.	564
Crosthwaite Furnaces & Scriven Machine Tools, Ltd.	
Cutler, Samuel, & Sons, Ltd.	
Cuxson, Gerrard & Co., Ltd.	

D

Davenport Engineering Co., Ltd.	
Davey, Paxman & Co., Ltd.	
De la Rue, Thomas, & Co., Ltd. (Gas Group)	
Demolition & Construction Co., Ltd.	
Dempster, R. & J., Ltd.	561
Dempster, Robert, & Sons, Ltd.	596
Denison & Son, Ltd.	
Derbyshire Silica Firebrick Co., Ltd.	
Diaphragm & General Leather Co., Ltd.	
Donkin (The Bryan) Co., Ltd.	Cover II
Douglas, Wm., & Sons, Ltd.	
Drakes, Ltd.	
Dresser Manufactures (England), Ltd.	
Drew, H. B., Ltd.	
Drummond Patents, Ltd.	
Dunlop Rubber Co., Ltd.	

E

Edgar, Wm. & Son Ltd.	612
Eimco (Great Britain) Ltd.	
Elcontrol, Ltd.	585
Electroflo Meters Co., Ltd.	
Electrolux, Ltd.	
Ellison, Geo., Ltd.	
Elliott Bros. (London), Ltd.	
Essard, Ltd.	
Essex Partners, Ltd.	
Ether, Ltd.	578
Evered & Co., Ltd.	
Ewart & Sons, Ltd.	
Ewart Chainbelt Co., Ltd.	611

F

Fisher & Ludlow, Ltd.	
Fisher Governor Co., Ltd.	
Flaxel, S., & Co., Ltd.	605
Fluidrive Engineering Co., Ltd.	
Ford Motor Co. Ltd.	
Fowler, John, & Co. (Leeds), Ltd.	

	PAGE
Franki Compressed Pile Co., Ltd.	
Furse, W. J. & Co., Ltd.	

G

Gas Purification, Ltd.	613
General Electric Co., Ltd.	
Gibbons Bros., Ltd.	565
Gibbons Heurtey, Ltd.	
Girdex Engineering Co., Ltd.	
Glover, George, & Co., Ltd.	
Glover, Thomas, & Co., Ltd.	Cover I, 586
Godfrey, Sir George, & Partners (Industrial),	568
Goodall Clayton & Co., Ltd.	612
Goodyear Industrial Rubber Products, Ltd.	
Graphite Products, Ltd.	
Green & Boulding, Ltd.	613

H

Hamilton, A. H., & Co., Ltd.	
Hardman & Holden, Ltd.	
Harris & Pearson, Ltd.	612
Harris Engineering Co., Ltd.	584
Harrisons (London), Ltd.	613
Harvey, G. A. & Co. (London), Ltd.	
Hick Hargreaves & Co., Ltd.	
Hilmor, Ltd.	
Hills (West Bromwich), Ltd.	
Holman, Michell & Co., Ltd.	
Holmes, W. C., & Co., Ltd.	615
Holst & Co., Ltd.	
Hopkinsons, Ltd.	
Horseley Bridge & Thomas Piggott, Ltd.	
Horstmann Gear Co., Ltd.	
Howden, James, & Co., Ltd.	
Hudswell, Clark & Co., Ltd.	
Hughes, F. A., & Co., Ltd.	
Humphreys & Glasgow, Ltd.	572
Hyde, Silas, Ltd.	

I

Ideal Boilers & Radiators, Ltd.	569
I.C.I., Ltd. (Metals Division)	570
Inertol, Ltd.	
Ingham, John, & Sons, Ltd.	

J

Jeavons, E. E., & Co., Ltd.	
Jeavons Engineering Co.	
Jenkins, W. J., & Co., Ltd.	
Jenolite Ltd.	
Johnson, C. H., (Machinery), Ltd.	
Joy-Sullivan Ltd.	

K

Keay, E. C. & J., Ltd.	568
Keelavite Rotary Pumps & Motors, Ltd.	
Keith Blackman, Ltd.	616
Kings Patent Agency, Ltd.	
King, Walter, Ltd.	611, 613, 614
Kirkham Hulett & Chandler, Ltd.	562

L

Lafarge Aluminous Cement Co., Ltd.	
Lamont, James H., & Co., Ltd.	
Le Bas Tube Co., Ltd.	
Leeds Fireclay Co., Ltd.	
Lee, Howl & Co., Ltd.	
Lincoln Electric Co., Ltd.	
Lionweld, Ltd.	
Lind, Peter, Ltd.	

M

MacLellan, George & Co., Ltd.	
Macpherson, Donald, & Co., Ltd.	
Magnetic Valve Co., Ltd.	
Main, R. & A., Ltd.	
Major Robinson & Co., Ltd.	
Mapel Metal & Pipeline Endurance, Ltd	
McNeill, F. & Co., Ltd.	
Maun Decorators.	
Meltham Silica Fire Brick Co., Ltd.	
Messengers & Sons (Birmingham) Ltd.	
Meters, Ltd.	
Metropolitan Gas Meters, Ltd.	
Metropolitan Vickers Electrical Co., Ltd.	579
Midland Iron & Hardware Co. (Cradley Heath), Ltd.	
Milne (Edinburgh) Ltd.	
Mint, Birmingham, Ltd.	
Mitchell Engineering, Ltd.	
Mitchell, H., & Co.	
Monitor Engineering & Oil Appliances, Ltd.	
Monk, A., & Co., Ltd.	
Mullan Bros., Ltd.	
Murex Welding Processes Ltd.	

N

National Benzole Co., Ltd.	
National Enamels, Ltd.	
Neal, R. H., Ltd.	
New Conveyor Co., Ltd.	576
Newton Chambers & Co., Ltd.	
Northern Manufacturing Co., Ltd.	
Norwest Construction Co., Ltd.	
Nu-Swift, Ltd.	

O

Oxley Engineering Co. Ltd.	

P

Parkinson & Cowan (Gas Meters), Ltd.	
Parkinson Stove Co., Ltd.	
Pass, E., & Co., Ltd.	
Peart, E., & Co., Ltd.	
Peebles & Co., Ltd.	
Perl Controls, Ltd.	

	PAGE
Plenty & Son, Ltd.	
Pointer, Harry (Norwich) Ltd.	611
Power-Gas Corporation, Ltd.	563
Press, William, & Son, Ltd.	
Pulsometer Engineering Co., Ltd.	Cover IV
Pyrene Co., Ltd.	

R

Radiant Heating, Ltd.	
Radiation, Ltd.	598, 599
Rawlplug Co., Ltd.	562
Reavell & Co., Ltd.	
Ride & Bell Ltd.	
Roberts, R. E., & Sons, Ltd.	
Robinson, J. H., & Co. (Liverpool), Ltd.	
Royston, Geo., & Sons, Ltd.	
Rozalex, Ltd.	
Russell, R., & Sons	

S

Salter, T. E. Ltd.	
Saunders Valve Co., Ltd.	567
Sawyer, Geo. E., Ltd.	
Scientific & Projections Ltd.	
Senior Economisers, Ltd.	
Siebe Gorman & Co., Ltd.	
Siemens-Schuckert (Great Britain), Ltd.	
Sigma Instrument Co., Ltd.	611
Silvertown Rubber Company Ltd	
Simon Engineering (Midlands), Ltd.	
Simon, Henry, Ltd.,	
Simon-Carves, Ltd.	
Simon, Richard, & Sons, Ltd.	
Sisson, W., & Co., Ltd.	
Smith & Nephew Ltd.	
Smith Meters, Ltd.	
Smith, Thos., & Sons (Rodley), Ltd.	
Spencer-Bonecourt Clarkson, Ltd.	573
Sperryn & Co., Ltd.	
Stanton Ironworks Co., Ltd.	
Staveley Iron & Chemical Co., Ltd.	
Stein, John G., & Co., Ltd.	
Stewart & Gray, Ltd.	
Stewarts & Lloyds, Ltd.	
Stillite Products, Ltd.	580
Stoves, Ltd.	
Strachan & Henshaw, Ltd.	
Stringer Bros.	
Sugg, Wm., & Co., Ltd.	
Summerson, Thos., & Sons Ltd.	
Sutcliffe Speakman & Co., Ltd.	
Sutherland, A. G., Ltd.	

T

T & T Works, Ltd.	
Tangyes, Ltd.	
Terry, Herbert & Sons, Ltd	
Thorp, Thomas, & Co., Ltd.	
Tully Engineering Co., Ltd.	
Turners Asbestos Cement Co., Ltd.	

U

Underpressure Engineering Co., Ltd.	580
Unit Superheater & Pipe Co., Ltd	573

V

Vaughan, Edgar, & Co., Ltd.	
Victaulic Co., Ltd.	
Visco Engineering Co., Ltd.	

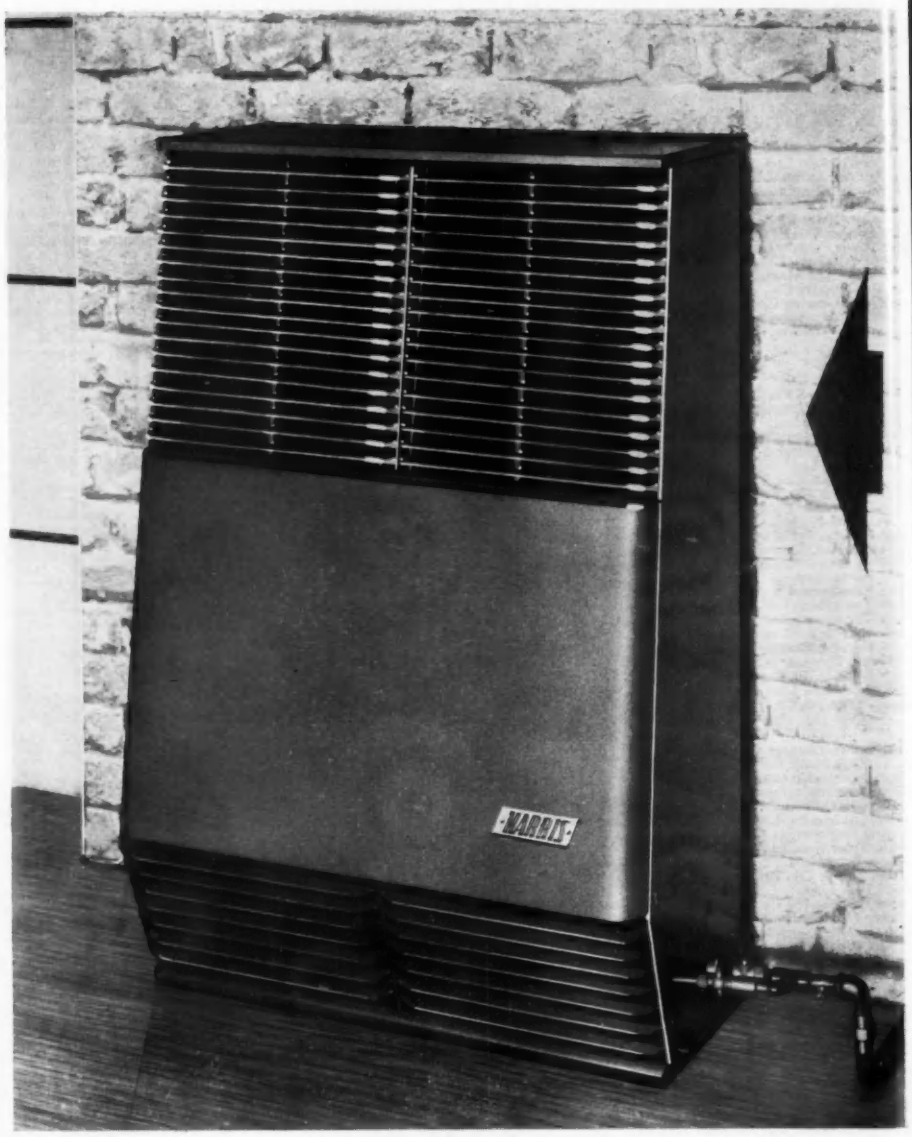
W

Wadsworth, Wm., & Sons Ltd.	
Wakelin, F. H., Ltd.	
Walker Bros., Ltd.	
Walker, C. & W., Ltd.	608
Walker, Crosweller & Co., Ltd.	
Walkers (Century Oils) Ltd.	
Waller, George, & Sons, Ltd.	
Walter King, Ltd.	611, 613, 614
Ward, Thos. W., Ltd.	
Warsop Power Tools, Ltd.	
Weir, G. & J., Ltd.	575
Wellington Tube Works, Ltd.	
Wellman Smith Owen Engineering Corpn., Ltd.	
West, Allen & Co., Ltd.	
West's Gas Improvement Co., Ltd.	Cover III
West's Piling & Construction Co.	
Westwood & Wrights, Ltd.	612
Wheeler, Ltd.	
Whitley Moran & Co., Ltd.	611
Whitlock Bros. Ltd.,	
Whittall's of Birmingham.	
Widnes Foundry and Engineering Co. Ltd.	
Wilkes, A. H., & Co., Ltd.	
Williamson, Cliff, Ltd.	
Wilson, George, Gas Meters, Ltd.	
Winn & Coales, Ltd.	
Woodall-Duckham Construction Co., Ltd.	595
Wood, Hugh, & Co., Ltd.	571

Y

Yorkshire Copper Works, Ltd.	

Agencies	
Appointments Vacant	613, 614
Appointments Wanted	
Books	
Contracts Open	
Educational	
Fellowship	
Miscellaneous	
Patents	
Plant &c. For Sale	613
Publications	
Public Notice	



HARRIS
ENGINEERING CO. LTD.

"WELLSWAY" Mark 2

This flued gas convector heater, designed by Leslie T. Minchin, was originally manufactured by the Attewell Engineering Co., Ltd., and is now produced by Harris Engineering Co., Ltd.

It has been completely re-styled and the gas rate is increased to 80 c.f.h. whilst retaining the good features of the interior construction.

This heater is ideal for use in factories, halls, schools, offices and churches, giving abundant heat without any possibility of condensation or corrosion of exposed metal surfaces in the building.

Further information gladly sent on request.

HARRIS ENGINEERING CO., LTD., Dept. No. BS/63, YORK WORKS, BROWNING STREET, LONDON, S.E.17. RODney 3835

and at BIRMINGHAM • BRISTOL • GLASGOW • MANCHESTER • NEWCASTLE-ON-TYNE • WAKEFIELD • COLERAINE (N. Ireland)

FWS

AUTOMATION STEP BY STEP

Practically all lighting-up procedures can now be carried out automatically and safely by one of the Elcontrol F.S.M. units. Based on the monitoring of the pilot and/or main flame by an Infra-Red sensitive cell, the F.S.M. automatic Controllers give push-button starting, timed pre-ignition purging, timed ignition, lock out on failure to light up, and running flame failure protection.

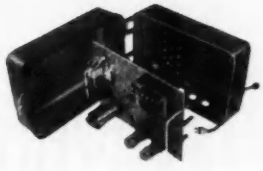
Units are available for a very wide variety of burner set-ups and our Advisory Service is at your disposal.

ELCONTROL
FSM
AUTOMATIC BURNER PROTECTION

FLAME FAILURE UNITS

Range also includes simple flame relay units. Most are of the withdrawable chassis type.
Prices from about £30

Oil Burner Manufacturers are specially catered for with units to suit their particular needs.



ELCONTROL LTD. 10 Wyndham Place, London, W.1
Ambassador 2671 For LEVEL CONTROLS, TIMERS FLAME FAILURE EQUIPMENT, PHOTOSWITCHES

Gas Journal

VOL. 288 NO. 4873 December 5, 1956

108TH YEAR

MANAGING DIRECTOR: Clifford A. King

EDITOR: Geoffrey W. Battison

TECHNICAL EDITOR: Charles J. P. de Winton, T.D., M.A., M.Inst.Gas E., M.Inst.F.

Published by Walter King Limited,
11, Bolt Court, Fleet St., London, E.C.4

Telephone: FLEet Street 2236-7 Telegrams: Gasking, Fleet

CONTENTS

EDITORIAL COMMENT

Education for Industry 587
Gas Without Coke 588

SPECIAL ARTICLE

Testing 1,840 Miles of Gas Pipeline by Atomic Energy. By Stephen Bond 593
Preparing a Technical Report Requires Special Qualities. By A. R. Myhill 597

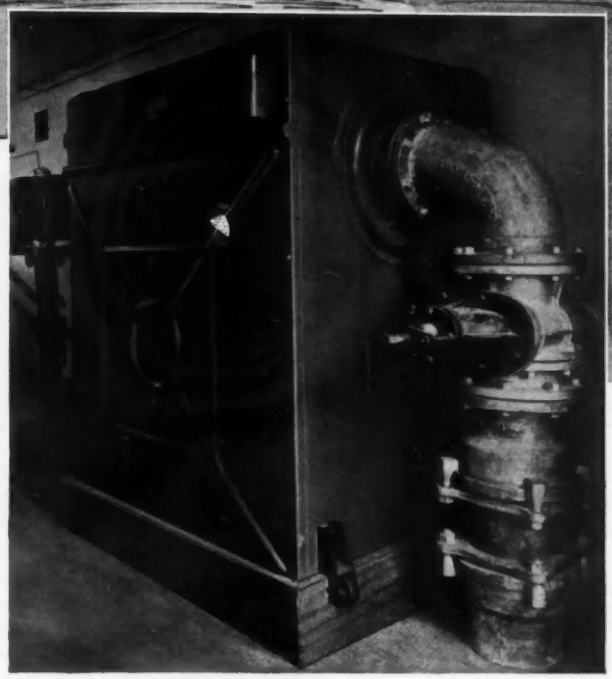
NEWS OF CURRENT EVENTS

Personal 589
Obituary 589
Diary 589
New 3 mill. cu. ft. Holder on Service 590
'Mad About Men' Plays to Capacity 590
Sc.G.B. to Test Constant Natural Gas Resources 590
Sugg Dividend Cut 590
National Poultry Show Cookery Competition 591
S.E.G.B. Joint Consultative Conference 591
Gas Flows from New Coke Ovens 591
Yorkshire Juniors Meet in Sheffield 591
Locomotive Worked for Two Years Non-stop 592
Show Up Shoddy Goods, W.G.F. Members Told 592
Gas Council Advertising Will Urge Restraint 592
31 Families Serve 3,300 Years With the N.T.G.B. 592
Recommendations for Mainlaying 608

TECHNICAL RECORD

Russia Experiments with Non-metal Gas Mains 594
Experiments on the Hydrogenation of Oils to Gaseous Hydrocarbons. By F. J. Dent, R. F. Edge, D. Hebden, F. C. Wood, and T. A. Yarwood 600
The Hydrocarbon Content of Fuel Gases. Discussion on Research Communication GC.31 609

PUBLISHERS' NOTICE, SEE PAGE 613



for any industrial requirement

Britain's industries use gas extensively, and wherever gas is used there's a gas meter . . . and it's likely to be a Thomas Glover meter. T.G.'s have supplied meters for all types of industrial establishments. We are specialists in the manufacture of meters for special requirements, and pride ourselves on being able to supply any capacity required—size is no obstacle. Why not consult us about your industrial requirements? You'll get the meter you want and you'll get it on time. You'll be satisfied with the T.G. service and the finished article. The T.G. Industrial Meter is a "tailor made" product of true craftsmanship, renowned for its accuracy in measurement.

THOMAS GLOVER & CO. LTD.

GOTHIC WORKS, ANGEL ROAD, EDMONTON
LONDON N18 and BRANCHES

TG3c

Gas Journal

VOLUME 288. No. 4873. DECEMBER, 5, 1956. 108th YEAR

Education for Industry

NEVER before in our history has the need for properly trained men in industry been greater. This applies to men and women at all grades of employment and not only among the higher executives. This was brought out by speakers at the recent dinner of the Coke Oven Managers' Association. Our sister industry, which appears to do things in a big way compared to the size of carbonising plants in the gas industry, has begun to find difficulty in recruiting men at all levels. This may be because in the lower grades the work is more exposed to the elements and in the upper grades the tie of immediate responsibility is too continuous. The solution to such a problem is one of mechanisation, or automation or both, and a most extensive system of education and training so that men of the foreman grade will be encouraged and helped to master the science of their industry and thus be better able to take responsibility. One speaker was most emphatic about the necessity of such improvement and was quite certain that if only enough energy and money could be devoted to such a scheme no obstacle of any importance need stand in our way. As an example he told of a recent visit to Russia and the evidence he saw there of the tremendous strides being made. The building of a brand new university in Moscow and the really immense sums being spent there convinced him of the possibilities open to a nation which was determined to improve its technical educational resources. Such a necessity is well known in this country too and many have advocated an extension of Government policy towards the founding of educational establishments, either new in themselves or as additional departments to existing universities and technical colleges.

Now what exactly are the types of men (and women, too) needed for our industrial expansion, or perhaps only to help us hold our place in the world? The purely scientific worker, or to give him his nickname, the 'boffin' or 'back room boy,' the technologist, who among other things must be capable of interpreting the brainwaves of the 'boffin' (which are often scribbled on the back of envelopes), and making them into practical propositions, and, thirdly, the technician whose job it will be to supervise the carrying out of any such scheme and be generally responsible that plant is maintained. Each of these types of scientifically trained manpower have their part to play and it would be invidious to single any one out and say it is more important than any other. Naturally the worker in pure science is recruited from a very special type of man with a special type of brain, the value of whose work is not always immediately apparent, but he shares the duties of research with the technological research establishments sponsored by individual industries outside the universities.

The technologist, with whom might be grouped engineers of all types, whether working on their own as consulting engineers or employed by industry, are the practical types who make use of this fundamental knowledge in the design and construction of plant, or the use of up-to-date methods in process work, metallurgy, or even modern civil engineering plant. The third group, the technician, is the executive, who must know his particular job thoroughly to direct others and to make certain that the product is indeed being turned out.

This is the chain of responsibility, and it is most important that nothing less than the best quality is aimed at. As it happens, the United Kingdom leads Europe in the number of its pure scientists for every million of the population, though in other grades it is sadly lacking, but it does seem to be symptomatic that this should be so. So much original thought appears to be available in this country which is shown in our advanced designs in aeronautics, our leading designs in television and radar up till the war, and our immense strides in atomic energy after the war when we had 'know how' and very little else to help us.

Two papers were recently read before the Institution of Mechanical Engineers which describe the American system of education and training and the European systems for training engineers. In America outside the universities there are the famous institutions such as the Massachusetts and the California Institutes of Technology. These are not technical colleges or technical schools as are known in England. They are 'universities' for engineers and technologists, and the

education and training carried out there bears no resemblance to English ideas of technical education. At these institutes are taught the fundamental principles of engineering and technological science, in fact, at the Californian Institute there is no means of learning machine drawing. From experience gained over the last 50 years the authorities have found that only by teaching fundamental principles can the engineering graduate ever hope to keep up to date, so rapid is the change in engineering application. The necessary specialist or vocational training is much better carried on by the industry itself in its own educational establishments which appear to be commoner there than in this country. On the Continent of Europe, technical educational development varies throughout Western Europe, where France is outstandingly well organised and provides training for all forms of applied science to Belgium where applied engineering is taught at any of the five universities, though only at Louvain are all taught. Western Germany is high on the list and insists on a high standard of knowledge before the degree or diploma, Diplom-Ingenieure, can be conferred. Switzerland is the most outstanding, and as might be expected, heads the list with an annual output of trained engineers at 81.6 per million of the population, with France second at 73.3, Denmark third at 71.6, and Belgium last with 41.5 per million. The United Kingdom is next to bottom with 44.6 per million. If these figures are compared with the United States and Soviet Russia the figures are even more staggering. In Russia there is an annual output of 280 technologists per million and in the U.S.A. 136 per million of the population. In pure science the United Kingdom leads Europe with an annual output of 105 per million compared to Russia with only 56 per million.

Every effort must be made to level up the numbers of available technologists in Western Europe, and Great Britain in particular. The Government are beginning to take steps to provide buildings and facilities and large sums are being set aside for these purposes. But we must not merely look upon this as a race for equality or superiority in numbers over our competitors in the world. Let us have quality and by quality is meant not merely more knowledgeable young men and women who can only talk their particular type of jargon, but an educated younger generation which can think for itself and by so doing strengthen our chances of holding our own and convince our customers abroad of our good faith and integrity.

Gas Without Coke

IN its heart of hearts the gas industry has always really been a one fuel industry. It had always tended to look upon coke as a necessary nuisance which was one of the disadvantages of an otherwise excellent process of making gas by the carbonising of coal. Water gas manufacture was an excellent way of using up coke, but that had its disadvantages too. Oil was expensive and the specific gravity of the gas was higher than straight coal gas.

Since the war, however, all that has changed. The Gas Council has seen what a useful fuel coke is, and at least two of the Area Boards have been engaged in research into the production of a really good open fire fuel which can take the place of raw coal. The burning of ordinary high temperature coke in boilers, closed and openable stoves and modern kitchen equipment has encouraged the use of coke in the household and also in the central heating equipment in some commercial premises. The coming of the Clean Air Act has also encouraged the supply of smokeless fuel from all sources, but still the idea of being a one fuel industry dies hard among gas engineers. Coke must be considered as a fuel on its own merits and priced accordingly and not be tied to the price set-up of gas manufacture, though perhaps the gas industry might be forgiven if in its own mind it considers that gas itself is the only smokeless fuel to be taken seriously.

It was with very great interest, therefore, that we read the paper, presented at the Autumn Research Meeting of the Institution by Dr. Dent and the other members of his research team and made a careful study of the ensuing discussion. Dr. Dent's paper, entitled 'Experiments on the Hydrogenation of Oils to Gaseous Hydrocarbons' gave a very full account of the work being carried out by his team on the pilot plant at Poole. Dr. Dent shows in this paper how far the knowledge of the hydrogenation of oils has proceeded and gives ideas for going on to a full scale plant. The gas is excellent, it can be made to conform to given specifications, it is low in organic sulphur and can be easily purified. Experiments have been done on a variety of feed stocks from a crude oil to a light distillate.

Those taking part in the discussion were unanimous in their approval of the process, though some may have remarked that perhaps now was not the most appropriate moment to rely too much on oil as our chief raw material for gas making.

Mr. Edwards, member of the Wales Gas Board, described his investigations into the possibilities of using some form of gas from oil on a very large scale, how effectively it could be done and how easily the gas could be transported over long distances. Another speaker pressed for higher declared calorific values to enable the thermal capacity of the grid mains to be raised. It was Dr. Foxwell, however, who brought the discussion onto really solid ground by asking how coke production was going to fare if enormous oil gasworks were indeed built. Gas is undoubtedly the most convenient smokeless fuel and provided the householder is not far from a gas main, it is always available at constant pressure and constant quality, but what of the price?

Solid fuel fired equipment in its most modern form is expensive, but its heating ability and efficiency have never been so high. Once installed it burns the cheapest form of fuel, but that fuel must be smokeless. That means coke, anthracite or some form of patent synthetic fuel. None cheap in themselves but all cheaper than gas when applied to continuous space heating, and even when the other factors of no dust and no heavy work are taken into account, how many of us can afford gas fired central heating? Perhaps the large scale production of gas from the hydrogenation of oil is not really just round the corner, so perhaps there is no need to be unduly worried about it, but we cannot help feeling that perhaps after all we poor coke consumers may have to return to the tender mercies of the National Coal Board to provide us with our solid fuel.

Personal

MR. P. H. BEAHAN has been appointed Education Officer to the North Eastern Gas Board from December 1. Mr. Beahan was educated at St. Michael's College, Leeds, Leeds College of Technology, and Leeds University, where he graduated in 1952 with a B.A. (Hons.) degree. He obtained the Graduate Certificate in Education the following year. He joins the Board from the Rubery Owen Group of Engineering Companies, Darlaston, where he was Communications Training Officer.

MR. ALEXANDER SPENCE, General Manager of the City of Newcastle Gas and Coke Co. Ltd., has been appointed a Director of the Company to fill a vacancy on the Board caused by the death of Major-General W. L'ESTRANGE EAMES, C.B., C.B.E. Mr. Spence is a past President of the Australian Gas Institute and is Vice-President of the National Gas Association of Australia.

MR. G. R. BUCKLEY and MR. C. G. MACKIE, Directors of The Stanton Ironworks Co., Ltd., have been appointed Assistant Managing Director (Works) and Assistant Managing Director (Commercial) respectively. MR. N. C. MACDIARMID has been appointed Assistant Managing Director (General). MR. C. H. WILSON, who retains the position of General Manager of the Company, has been appointed a Director.

MR. E. G. THOMPSON has been appointed Technical Sales Manager of Baird and Tatlock (London), Ltd., and has relinquished his post of Public Relations Officer which has been taken over by MR. D. J. WYKES.

MR. W. H. SALES has been appointed Chairman of the North Eastern Division of the National Coal Board in succession to MAJOR-GENERAL SIR NOEL HOLMES who is vacating this office at the end of January, 1957.

MR. H. L. BATEMAN, of Dewsbury, has retired as Engineer and Manager to the Dewsbury and Ossett gas undertakings, but will continue to serve the North Eastern Gas Board in a consultative capacity.

Obituary

COLONEL W. MONCRIEFF CARR, C.B.E., T.D., died of a heart attack in the hunting field on December 1. He was 70 years of age. Colonel Carr was educated at Manchester University, Owens College, where he took the Engineering Certificate. He was afterwards pupil under the late Lieut.-Colonel J. Mitchell Moncrieff, C.B.E., civil engineer, of Newcastle, and was engaged in bridge and dock construction work. In 1907 he joined his father, the late Mr. Isaac Carr, in his gas and water consulting engineering practice and assisted in the design and construction of a number of new gasworks. In 1911, Colonel Carr, while continuing his consulting work, became Engineer and Manager of the Ormskirk District Gas Company, and in 1922 was appointed Engineer and General Manager of the Stretford and District Gas Board. After 13 years' successful work at Stretford he was one of the founders of the United Kingdom Gas Corporation, one of the first and the largest of the gas holding companies. In the same year—1935—he was elected President of the Institution of Gas Engineers. He remained at Stretford until the end of 1936, when he resigned in order to devote his whole attention to the United Kingdom Gas Corporation, of which he had become Managing Director. He continued in that office until the death of Mr. R. B. Ottley, whom he succeeded as Chairman of the

Corporation. Since the early days of the first world war Colonel Carr had taken an active interest in the Territorial Army. He was appointed Honorary Colonel of the 55th (West Lancashire) Divisional Engineers, Territorial Army, in 1934. He received the rank of Brevet-Colonel in 1930, was awarded the Territorial Decoration in 1929, and the O.B.E. (Military Division) in the 1936 Birthday Honours. Colonel Carr became Chairman of the North Western Gas Board at vesting date. He was awarded the C.B.E. in the 1950 Birthday Honours and in that year retired from the North Western Board. His brother, Mr. James Carr, O.B.E., M.C., is Deputy Chairman of the South Western Gas Board. Colonel Carr is survived by his wife, Vera.

MR. DAVID HENRY DAVIES, who was Engineer and Manager of the Herne Bay Gas Company from 1918 until 1937, when he retired, has died aged 81. Mr. Davies had been a member of the Institution of Gas Engineers since 1909. From 1904 to 1918 he was Engineer and Manager of the Nantwich Gas Undertaking, where he succeeded his father, JOHN DAVIES, who had held the appointment from 1870, having previously been Engineer and Manager of the Ruthin and Flint Undertakings. Mr. Davies leaves a widow and one son, David Stanley Davies, who is Engineer and Manager of the Abertillery and Ebbw Vale undertakings of the Wales Gas Board. Mr. Davies' family have already completed 100 years' unbroken service in the Gas Industry.

MR. A. E. BALE, of Bale and Church, Ltd. (proprietors of the Kleenoff Co.), has died aged 74, having been Chairman of the company for 54 years. In 1901 he succeeded his father in the business of Bale & Co. and in 1911 the firm became known as Bale & Church, Ltd., Kleenoff having been introduced in 1910. In 1934 Mr. Bale's nephew, Mr. R. J. J. Bale, entered the firm and was subsequently appointed Vice-Chairman.

MR. FREDERICK NICHOLLS, D.S.M., who had been Senior Chemist in the central laboratory of the Northern Gas Board since 1953, has died aged 62. Mr. Nicholls entered the service of the Newcastle and Gateshead Gas Company shortly after obtaining his science degree at the Armstrong College, Newcastle, in 1919. He subsequently held the position of Senior Chemist at the Redheugh and, later, Elswick works.

MR. CLEMENT STREDWICK, Chief Accountant, South Eastern Gas Board, died on November 30, at his home at Carshalton, Surrey, aged 57. The funeral service takes place today.

Diary

December 6.—SOUTH WESTERN G.C.C.: 34, Bridge Street, Taunton. 11 a.m.

December 7. — I.G.E., MANCHESTER AND DISTRICT SECTION: Engineers' Club, Albert Square, Manchester. 2.30 p.m. Joint meeting with the Institute of Fuel. Luncheon at the Engineers' Club. 12.30 p.m. for 1 p.m.

December 8. — EAST OF SCOTLAND JUNIORS: Joint meeting with Scottish Western Juniors, Edinburgh. Address by Sydney Smith, Chairman, Scottish Gas Board.

December 8. — SCOTTISH (WESTERN) JUNIORS: Albany Street Social Club Rooms, Edinburgh. 3 p.m. Speaker: Mr. Sydney Smith, Chairman, Scottish Gas Board.

December 10. — INCORPORATED PLANT ENGINEERS: Joint meeting with the Institute of Materials Handling at the Institution of Engineers and Shipbuilders, Glasgow. 'The Plant Engineer's Approach to Materials Handling.'

December 11. — MIDLAND JUNIORS, GENERAL MEETING: Staff Mess Room, Birmingham District, West Midlands Gas Board. 6.30 p.m. 'Gas is Competitive,' by A. Higgs.

December 11.—LONDON AND COUNTIES COKE SALES SERVICE: Connaught Rooms (Devon Room), Great Queen Street, Kingsway, W.C.2. 2.30 p.m.

December 12. — INCORPORATED PLANT ENGINEERS: Grand Hotel, Bristol. 7.15 p.m. 'Combustion and Steam Raising,' by D. C. Gunn.

December 12.—WALES AND MONMOUTHSHIRE JUNIORS, SOUTH WALES AREA: Whitland. Visit to gasworks.

December 12.—ENGINEERS' GUILD LTD., A.G.M.: Grosvenor Hotel, Victoria, S.W.1. 5.45 p.m.

December 12.—WALES G.C.C.: Gas Board Offices, Bute Terrace, Cardiff. 2.30 p.m.

New 3 mill. cu. ft. Holder

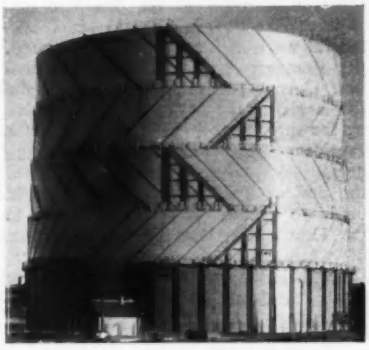
EDINBURGH PROJECT WAS DECIDED BEFORE VESTING DAY

RECENTLY completed for the Scottish Gas Board at the Sighthill industrial estate on the outskirts of Edinburgh, a new gasholder is now on service, as part of a scheme for the integrated supply of gas to the western side of the city and to those parts of Mid and West Lothian supplied by the Edinburgh Division.

Although ordered after nationalisation, the original decision to carry out the project was made by the Gas Department of the Edinburgh Corporation.

With a delivering capacity of 3 mill. cu.ft. the new holder is of the spirally guided type with four lifts in steel tank 182 ft. 6 in. diameter by 33 ft. 10 in. deep.

The centre of the crown dome rises through its stroke to a maximum height of 170 ft. 3 in. above ground, and with it the crown framing which is integral with the inner lift. Some 1,480 tons of steel have been used in the construction, which is riveted throughout. The tank contains 5,471,000 gal. of water, and filling was completed in seven weeks. Staircases on the tank and gasholder are of conventional design, and the two roller type all-steel carriages are of the rotating axle type embodying latest features.



The principal contractors engaged in the work were James White (Contractors), Ltd., Edinburgh, responsible for clearing site, making roadways and fencing and gatehouse; and Robt. Dempster & Sons, Ltd., Elland, Yorks, for gasholder and foundations.

Natural Gas

Sc.G.B. PLANS LENGTHY TEST AT COUSLAND

AS part of the Gas Council five-year plan for the search for natural gas in Britain, the Scottish Gas Board is to carry out a prolonged test at Cousland, near Edinburgh.

While the test is in operation, consumers in the Musselburgh and East Lothian areas of Scotland will be using town gas consisting of a mixture of natural gas and coal gas.

The presence of natural gas at Cousland was proved by an exploration well drilled by the B.P. Exploration Company before the war, but the size of the reservoir was not established with accuracy.

By using the natural gas from the existing well it will be possible to observe pressure decline that will enable a decision to be made on the advisability of drilling another well in the neighbourhood.

Natural gas has a calorific value of more than double that of normal coal gas. If the test at Cousland leads to commercial production a saving of 5,000 to 10,000 tons of coal per annum could result.

'Mad about Men' Plays to Capacity

THERE was not a vacant seat at the Rudolph Steiner Hall on November 27 when the Gas Council Dramatic Society presented 'Mad About Men,' by Peter Blackmore. This was a most ambitious production for amateurs, but they proved themselves well able to cope with the various difficulties a comedy of this nature involved.

The star of the performance was Margaret Beaven, who played the dual rôle of Caroline Trewella and her mermaid cousin, Miranda, extremely well. The play was lively and very well acted by the supporting cast, and a special word must be given to Mr. Tommy Cook, for a first-class production.

'A Lot of Work'

When the applause had died down, Sir Harold Smith told the audience that this was the seventh production by the G.C.D.S., and of these five had been produced by Mr. Cook.

'It seems a pity,' he said, 'that everyone should put in such a lot of work just for one night, but unfortunately at the moment we do not think we can fill the theatre for two nights. There is another production on May 7, and if everyone applies for tickets in very good time you may force those concerned to do the show for two nights.'

He then congratulated the cast on their performance, and presented bouquets to the ladies.

DROP IN BRASS PRICE CUTS DIVIDEND

Reduction in arms work hits profits

THE drop in the price of brass was blamed by the Chairman and Managing Director of William Sugg & Co., Ltd., Mr. W. T. Mattock, for the reduction in the final dividend (reported in our November 21 issue), at the annual meeting in London last week.

The major part of the material carried in stock was brass. At June 30, 1955, brass rod had been 2s. 5d. a lb.; in March this year it rose to 2s. 11½d. a lb.; but by June 30 it was down to 2s. 2d. a lb.

The Chairman added that they had accepted an offer for the redundant Ranelagh works, subject to the sanction of the Capital Issues Committee, which should mean a capital profit of about £40,000.

In his statement to the shareholders circulated in advance of the meeting with the accounts, the Chairman said that a considerable reduction in armaments work, which he forecast a year ago, had had a serious effect on profits.

Appliance Range Increased

The Company had increased its range of heating appliances and the new models appeared to be achieving considerable popularity. Production was expanding at their Crawley factory, and the acquisition of Cowper Penfold & Co., Ltd., and Thomas Mattock & Co., Ltd., had been justified.

They hoped that in spite of the credit squeeze and hire-purchase restrictions they would still further increase appliance sales, and unless adverse factors arose results for 1956-57 should be better than those for 1955-56.

Later, Mr. Mattock handed a cheque for £50, for 50 years' continuous service, to Mr. H. W. Burns; a gold watch, for 40 years' continuous service, to Mr. H. S. Dean, Mr. W. C. Rose, Mr. E. J. Chandler and Mr. E. J. Lloyd; and silver salvers, for 30 years' continuous service, to Mr. F. Wates, Mr. E. J. Quy, Mr. J. G. Anderson, Mr. F. Fulker, Mr. G. F. Allen, and Mr. L. F. Vivian.

DIVIDENDS AND REPORTS

Brisbane Gas Co., Ltd., net profit for the year ended June 30, 1956, was £75,037 (against £84,835 in 1955). Final dividend is recommended of 2½%, absorbing £39,684 (against 3½%, absorbing £44,169) and making 6% for the year (against 7%). Carry-forward is £20 (against £40,401).

Det Danske Gascompagni balance of profit for the year ended June 30, 1956, was Kr. 311,944 (against Kr. 310,929). Proposed dividend for the year is 8%, requiring Kr. 307,076 (same).

Twelve Women Seek Champion Cook Title

Final of Contest Being Staged at Poultry Show

WINNERS from the 1,000 countrywomen who entered for the National Poultry Show's Champion Cook Competition are in London this week for the final, which is being held during the run of the Poultry Show at Olympia from today until Friday.

In three well-equipped kitchens, representing gas, electricity, and solid fuel, 12 finalists will cook a two-course meal, the menu for which they have chosen themselves, at a cost not exceeding 25s. There will be four finalists to each kitchen, and they will cook their competition meal by the fuel they normally use.

Cooking times in each of the three kitchens are 3.30 p.m. today, and 11.30 p.m. tomorrow and Friday. The judges will be Mrs. Joan Robins, T.V. housecraft expert, representing the gas industry; Miss Mary Gilbert, of the Electrical Development Association; and Miss M. Ashworth, representing solid fuel.

The prizes, which are in cash, will be presented on Friday afternoon at 3.30 p.m., by Miss Gwen Berryman, who plays 'Doris Archer' in the B.B.C.'s country series.

The first stage of the contest was a simple one. Competitors had to bake a Victoria sponge to a given recipe, stating the type of fuel used.

All the finalists in the gas kitchen have farming or poultry interests. From Hinckley, Leicestershire, is Mrs. M. A. Abell, who is a farmer's daughter, and poultry keeper. She has never entered for a competition before. While she is away in London her husband will look after her birds.

Then there are two farmers' wives, Mrs. F. K. Rose of Cedars Farm, Brixworth, Northants, and Mrs. A. Walker, from Kirkheaton, Yorkshire. Both are enthusiastic cooks, so competition between them should be keen.

For 20-year-old Miss Peggy Roderick, the only competitor from Wales, who lives in the village of Abercanaid on the mountainside near Merthyr Tydfil, the event is an important one, for it will be her first trip to London. Peggy began cooking two years ago under her mother's tuition.

At Olympia the finalists will find a gas streamlined kitchen equipped with some of the latest gas appliances, including a Radiation New World 85 cooker, with eye-level grill, a new water heater, the Main 'Adonis' and an Electrolux 230 refrigerator, and in fact everything that a housewife could wish.

As farmers' wives and countrywomen generally are acknowledged to be excellent cooks, competition will be keen and the contest should prove an interesting one.

GAS FLOWS FROM NEW COKE OVENS

GAS flowed for the first time from the new 150-coke-oven-plant of Dorman Long & Co., Ltd., Cleveland, Teesside, on November 28. Simon-Carves were the builders.

The installation will use up to 25,000 tons of coal a week and yield about 15,000 tons of graded coke, which will be mainly used in the firm's vast new Clay Lane blast furnaces now nearing completion.

The gas will go to steel furnaces and plant at Cleveland, Lackenby, and Redcar.

JOINT CONSULTATIVE COMMITTEES LOOK AHEAD

DO MANAGERS FEAR ADVANCE IN METHODS?

PROGRESSIVE innovations like method study and automation are often resisted more by the middle ranks of management than by the men, Mr. Aidan Crawley, author, journalist and broadcaster, told a South Eastern Gas Board conference of joint consultative committees at Wandsworth on November 29. Mr. Crawley, a guest, was speaking from experience he gained while gathering material for a TV series on industry here and abroad.

Sixty-one joint consultative committees were represented at the conference, now a Board annual function of which half is devoted to speeches from trade union leaders and others, and half to practical matters arising from the committees' workings. In the chair was Mr. W. K. Hutchison, Chairman of the Board.

Mr. Crawley said that in some industries there was very little method study — a subject which he considered 'desperately important.' In the field of automation he had been told that union membership was less likely to be more difficult—although it feared redundancy —than management, who feared a change in the whole character of management.

Mr. Crawley also mentioned restrictive trade practices, both among manufacturers and among workers. In the case of union restrictive practices he thought they were brought about by fear of others earning more and working so fast as to make life difficult, and fear of unemployment.

But, he concluded, if this country was to remain competitive, the fear that created restrictive practices must be conquered.

Mr. Aidan Crawley speaking at Wandsworth.

Yorkshire Juniors Meet in Sheffield

DESPITE petrol shortages, between 80 and 90 assembled at a meeting of the Yorkshire Junior Gas Association in Sheffield, on December 1, to hear Mr. S. Thackray and Mr. C. H. Rann give their paper 'Warming of Buildings by High Intensity Radiant Heaters with Some Aspects of Control,' and to support Mr. R. H. Anderson, the new President.

The joint authors of the paper are respectively Assistant Industrial Engineer and Industrial Technical Assistant with the Wakefield Group of the North Eastern Gas Board, and their paper, describing radiant heating installations in factories, warehouses, and churches, was highly commended by Mr. C. G. Broome of the Wakefield Group.

The paper, which was followed by lantern slides, left little time for discussion but questions were asked by Mr. Anderson, Mr. W. J. Steed, Mr. V. J. J. Siddons, Mr. E. S. Carter, Mr. P. F. Kirby, Mr. E. Evers, Mr. D. F. Oates, and Mr. A. Moore, and others.

It was announced that Mr. Carter, now senior Vice-Chairman, had been compelled to resign as Transactions Secretary, and that Mr. C. Roberts had taken on the job with the assistance of Mr. R. C. Croasdell in Wakefield Area.

The next meeting will be on January 5, at Wakefield, when Mr. P. C. Egan will give a paper 'Gastechnik System of Dry Purification.'

BORN 1923—STILL GOING STRONG

Locomotive Worked For Two Years Virtually Non-stop

DURING the last two of its 33 years with Dumbarton gasworks, the 8-ton locomotive pictured on this page worked virtually non-stop 24 hours a day seven days a week: Eight hours a day hauling coal, coke, and tar on the gas production side; 16 hours a day hauling materials required in the construction of the new works.

All its life the locomotive has had to haul its loads on a 1 in 70 gradient. Commissioned in September, 1923, it worked continuously until April, 1956.

One Major Repair

During its life the only major repair entailed the installation, in 1937, of one reconditioned 40 h.p. Dorman petrol engine. The gearbox and clutch mechanism, and all other driving parts, are original.

For the first 31 years of its working life no other locomotive was in use at Dumbarton, which meant that it had to carry out all haulage work unaided. During that time over 1 mill. tons of coal, and over 650,000 tons of coke were handled, and these figures do not include the handling in and out of stock of coal and coke.

The initial cost of the locomotive in 1923 was £1,250 and after its reconditioning and overhaul at Motor Rail, Ltd., Bedford, a further long and successful working life is expected at Vale of Leven works.

SHOW UP SHODDY GOODS, W.G.F. MEMBERS TOLD

A PLEA to women to be more outspoken about shoddy materials or articles they might encounter was made by the Mayor of Southampton, Alderman, Mrs. K. E. Cawte, J.P., at Southampton, recently, when she spoke as President of the newly formed Southampton branch of the Women's Gas Federation.

'It is no use muttering behind your hand about it. That does not do any good. It is only by pointing out shoddy items that you will get improvements,' she said.

Dame Vera Laughton Mathews, Adviser on Women's Affairs to the Gas Council, outlined the functions of a local W.G.F. branch, and spoke of the air pollution caused by some types of solid fuel.

Officers elected were: Mrs. O. R. Downer (Chairman), Mrs. J. B. Rees (Secretary), Mrs. N. Pead (Treasurer) and four committee members.

G.C. Advertisements Will Urge Restraint

ON October 24 the 'GAS JOURNAL' announced the re-appearance of Gas Council advertisements in the national newspapers. Now, as a result of the fuel crisis, the Gas Council has found it necessary to cancel this advertising completely. In accordance with usual practice space was booked 28 days ahead and therefore Gas Council advertisements will continue to be seen until about the end of this month, but instead of carrying a sales message their theme will be one of restraint, appealing to consumers to use gas with care.

NEWS IN BRIEF

130 Work in New Surroundings

WITH the closing of the coking and by-product plant at Mitchell Main Colliery, 130 employees are chell Main colliery, 130 employees are being transferred to the new carbonisation plant at Manvers, near Mexborough.

The Mitchell Main plant was established in 1904. The colliery itself closed some weeks ago and the 750 employees are now in neighbouring Darfield Main colliery.

31 FAMILIES SERVE 3,300 YEARS WITH THE N.T.G.B.

LONG service awards were handed to 31 employees of the North Thames Gas Board—each of whom had completed 40 years' service with the Board—at a ceremony in the Board's offices in Westminster, recently.

Presentations were made by Mr. Michael Milne-Watson, Chairman of the Board, who referred to the tradition of family service in the gas industry—the total family service of those receiving awards came to over 3,300 years.

Reunions Held

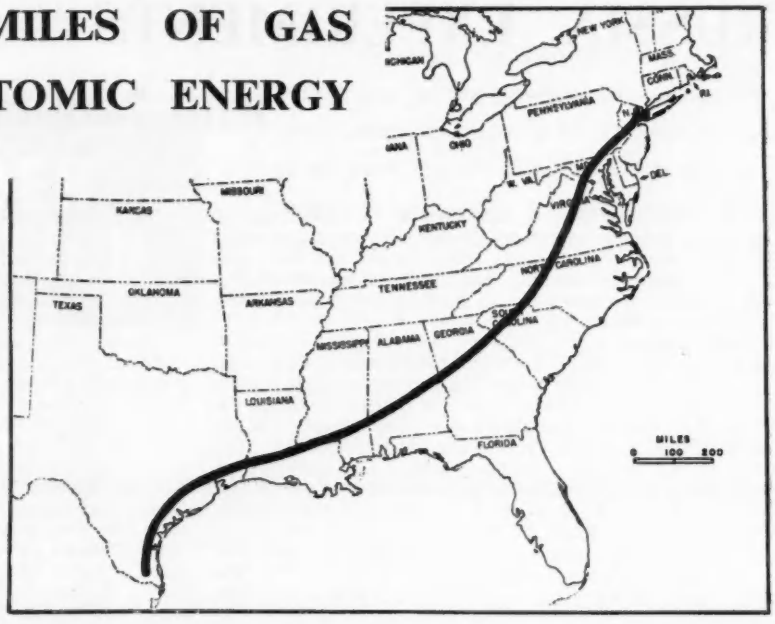
The fourth annual reunion for pensioners from the Brentford gasworks and the motor repair shops of the N.T.G.B. was held recently in the Board's clubroom at Montgomrey Wharf, 120 pensioners and guests being present.

Guest of honour was the Mayor of Brentford and Chiswick, Alderman Mrs. A. Burden, J.P., who, with her husband, was present throughout the evening. Oldest pensioner present was 89-year-old Mr. C. Hutchinson, who was pensioned 24 years ago after 42 years' service at Brentford.

Another recent N.T.G.B. reunion was for Southend pensioners. Organised by the Southend Gaslight Sports Club, it is 20 years since this function was last held.

TESTING 1,840 MILES OF GAS PIPELINE BY ATOMIC ENERGY

by STEPHEN BOND



THE largest and longest pipeline ever to be tested thoroughly by means of atomic energy was recently completed in the United States of America. It is the 36-in., 1,840 mile-long transmission line of the Transcontinental Gas Pipe Line Corporation, through which natural gas for 17 mill. consumers is pumped from the south-western state of Texas to the Atlantic Coast.

A vital element in the construction of this pipeline was the welding procedure. Pipe lengths had to be perfectly welded to withstand the force of gas pumped under high pressure.

Radiography, the fastest and most effective method of detecting flaws, was chosen as the best test method, and radioactive Cobalt-60 was selected to perform the radiography. Cobalt-60 has the advantage of being easily transported, and one gram will retain its force for five years. Even with this speedy method, testing a pipeline nearly 2,000 miles long was an arduous undertaking.

For a complete inspection of a pipeline weld, two radiographs must be made, each half of the circumference being radiographed separately. The process involves strapping unexposed film around half the pipe weld on the outside of the pipe and placing a source of gamma rays opposite the film, also on the outside of the pipe.

The gamma rays quickly record any welding faults on the film. They penetrate holes or thin sections more readily than a solid weld, causing dark spots to be recorded on the film. The film is processed and studied on site.

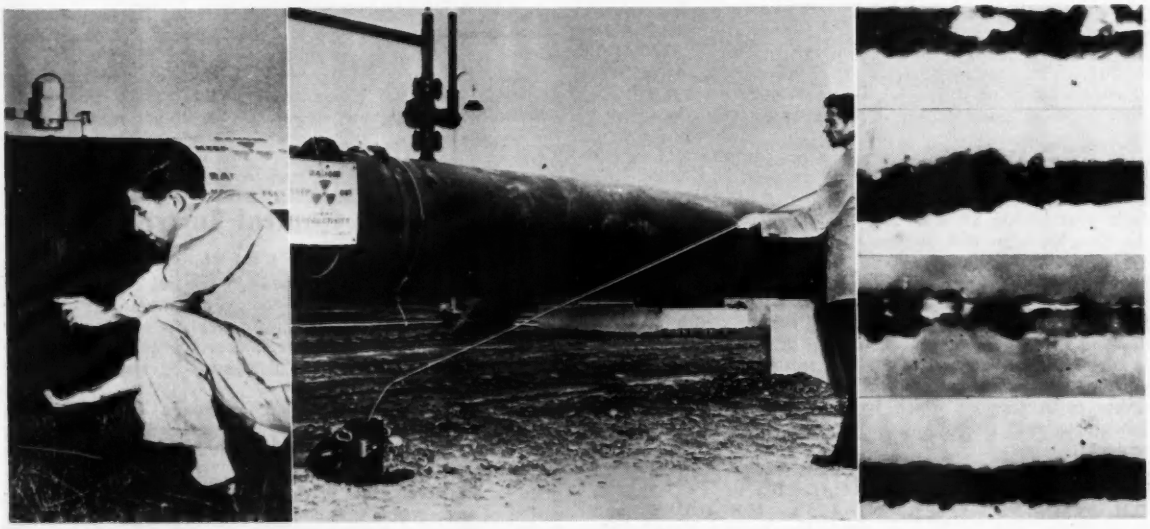
Radiography utilises two properties of gamma radiation: its ability to penetrate solid, thick materials and its darkening action on photographic film.

Conventional procedures used prior to the development of radiography involved cutting out a weld for examination, a method that was inaccurate, lengthy and expensive. The earlier method failed to locate many of the types of weld defects, but gamma rays detect all types and provides a permanent film record.

With expert welders, only 10% of the welds in a pipeline need to be inspected, but all those to be buried under bridges, roads or expanses of water are radiographed to reduce danger and maintenance costs.

The use of this new atomic testing procedure in construction of the pipeline saved countless thousands of pounds, which would have been spent in weld tests during construction and, for many years to come, in maintenance.

The result is safety, uninterrupted service and a lower rate paid for the 250,000 mill. cu.ft. of natural gas which the pipeline delivers every year to 17 mill. consumers in the States of Texas, Mississippi, Alabama, Georgia, North Carolina, South Carolina, Virginia, Maryland, Delaware, Pennsylvania, New Jersey, and New York.



Left: *A worker is applying unexposed film ready to make a radiograph. (The 'capsule' shown is empty, of course.)* **Centre:** *Tulsing the radioactive cobalt 'capsule' from its lead container to place in position opposite the film.* **Right:** *Four examples of defects revealed on film.*

RUSSIA EXPERIMENTS with Non-metal Gas Mains

GREAT strides have been made in the manufacture of steel pipes and it is for this reason that their use as gas mains has been universally adopted. Their success has been such that very little thought has been given to the use of any other metal or substance for the manufacture of pipes which could replace them.

Notwithstanding their sturdiness and efficiency, however, steel pipes, when used as gas mains, have certain shortcomings. For instance, the various corrosive components of gas such as sulphurated hydrogen, carbonic acid, moisture, etc., attack the metal, and experience has shown that pipes deteriorate at an alarming rate, especially when ferric oxide is present. The walls corrode and get thinner and fittings also suffer.

Natural gas, too, which has a high concentration of sulphurated hydrogen, can, when it comes in contact with moisture, make a gas main completely unusable in a very short time. As an example of this deterioration we know that in the oil producing region of Baku on the Caspian Sea, the natural gas with a content of 2-11% of sulphurated hydrogen has caused the various networks and the mains leading to the pumping and supercharging stations to be completely unusable after two and a half years. The 10 in. main connecting the compressors to the sulphur-free storage depôt of the petrol plant is rendered useless every two years, and the gas main which spans the Belaya River has to be replaced every 18 months.

When these gas mains are changed and brought back to the depôt for inspection they are always found to be so corroded and clogged with corrosive matter as to block the bore of the pipe to a remarkable degree. Similar facts are being reported, although to a lesser degree, from Kuibishev, Tchkalov, and other districts of Zavoljie.

This deterioration is common not only to all gas mains but to the majority of metal gas pipes, and notwithstanding all the research carried out in trying to eliminate it the distribution engineer in this field has had to look around for a pipe made of material other than metal.

Use of Asbestos Cement Pipes

Both in the Soviet Union and abroad asbestos cement pipes have been used for water mains, cable ducts and conduits, etc., with great success. They have stood up well to the stresses and strains required of modern mains and in the opinion of the engineer, this type of pipe can undoubtedly be used for gas mains, especially in places such as those mentioned where the degree of deterioration is high. Russian engineers have already carried out a series of experiments with asbestos cement pipes and it is known that similar tests have also taken place abroad.

In 1943, a test main of asbestos cement was laid in the Province of Andijan in Southern Russia, details of which are: Length, just under five miles; diameter of pipe, 12 in.; while each pipe is 13½ ft. long and the pipe connections are of the Simplex type with rubber rings. The right angle bends are of French design, made of iron, and are connected by asbestos couplings of the Gebot type. The main is laid in rough terrain at an average depth of 4 ft. Approximately three miles of its total length is along the forest line which is dry and the remaining distance is laid in a cotton field which is kept constantly watered. It is interesting to note that the area in which this main is laid is seismic and prone to very severe earth tremors which have in the past caused much damage to steel mains but none to those made of asbestos cement.

The constituents of the gas pumped along this test main is as follows: *CH_4—66.5%, C_2H_2—16.6%, CO_2—0.21%, C_3H_6—9.35%, C_4—3.065%, N_2—4.25%, H_2S—0.025%, and oxygen free, with an average yearly temperature in the main of 66°F.

* This is a direct translation from the Russian original, so if readers find unusual items in this analysis, they must draw their own conclusions.

The engineers have been very thorough in carrying out this experiment, and in order to satisfy themselves that asbestos cement pipes could, when necessary, replace steel ones, decided to analyse two samples of pipe made of this material. One sample (A) was cut at random from the Andijan test main and the other (B) a section of pipe, similar in size to that used in the test main, was taken from stores. Both these samples were submitted to a rigorous test which was recorded and compared. For instance, at a gas pressure of two atmospheres sample (A) proved completely gastight and its maximum water saturation point was 12.89% as against 15.78% of sample (B). The weight of sample (A), which had been lying underground for a number of years, was approximately 10% greater than sample (B) and because of this the physical structure of sample (A) had changed. Although two atmospheres is by no means a high pressure, pipes would, if treated internally with a special hardened lacquer, be able to withstand pressures of up to 20 atmospheres and if a steel wire be bound round the pipe externally pressures up to 40 atmospheres could be reached without difficulty.

Although results so far have proved positive, much more research is necessary before it can be said that asbestos cement pipes could entirely replace steel ones. The Ministry of Works, who have so far taken these experiments rather lightheartedly, must now co-operate to the full if another test main is to be finished by the end of 1956.

Search for New Materials

Keeping this in mind, let us then for the time being turn from these experiments with asbestos cement pipes and take a look at other materials from which pipes could be made. For instance, fibreglass, plastic, and other materials derived from the by-products of coal and now widely used in the chemical industry, such as viniplast, textolit and phaolit.

In the last few years, pipe-making techniques with these new materials have made possible the manufacture of thin wall pipes owing to the strength of the raw material; the lining of the interior with a gas proof and specially hardened lacquer; the construction of special connecting couplings able to withstand high pressures and be guaranteed gasproof; the construction of a special steel wire mesh to be wound round those sections of pipe which are subjected to greater stresses —such as those used in spanning rivers; and the easy transfer of an assortment of those corrosive by-products which have heretofore caused so much havoc to steel pipes.

Let us then go forward with our various experiments in the knowledge that all this research is not in vain but in the interests of national economy. The use of non-metallic pipes for gas mains is no longer a dream but a reality.

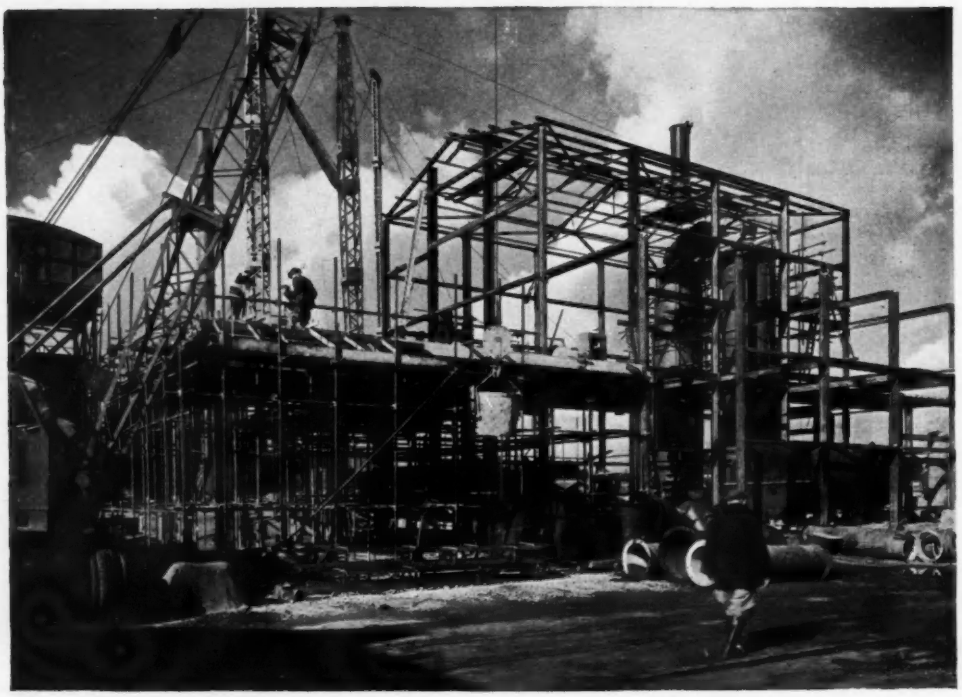
Automatic Control Instruments

IN the introduction to a new F.B.I. Handbook 'Applications of Instrumentation and Automatic Control' (Federation of British Industries, 5s.), it is pointed out that, in spite of the inestimable value of measuring instruments, a surprisingly large number of factories and boiler houses are operated with the bare minimum of instruments demanded by statutory regulations.

The booklet emphasises that automatic control releases labour for other duties and, if properly applied and maintained, results in a better and more consistent final product with less wastage of raw materials and power. The booklet was compiled as a general guide to the principles and means of application of instruments and controls customarily used by manufacturing industry for steam raising and industrial processes. The text was written for the British Industrial Measuring and Control Apparatus Manufacturers' Association by Mr. A. Linford.

NOW UNDER CONSTRUCTION

The W-D/Gasmaco Oil Gasification Plant (Hall Process of the American Gas Association) now nearing completion at the Gloucester Works of the South Western Gas Board. This plant, which will have a daily gas-making capacity in excess of one million cu. ft. of 1,000 B.Th.U. gas, will use a wide range of feedstocks from primary flash distillates to heavy oil.
A recent order to duplicate this installation has been received.

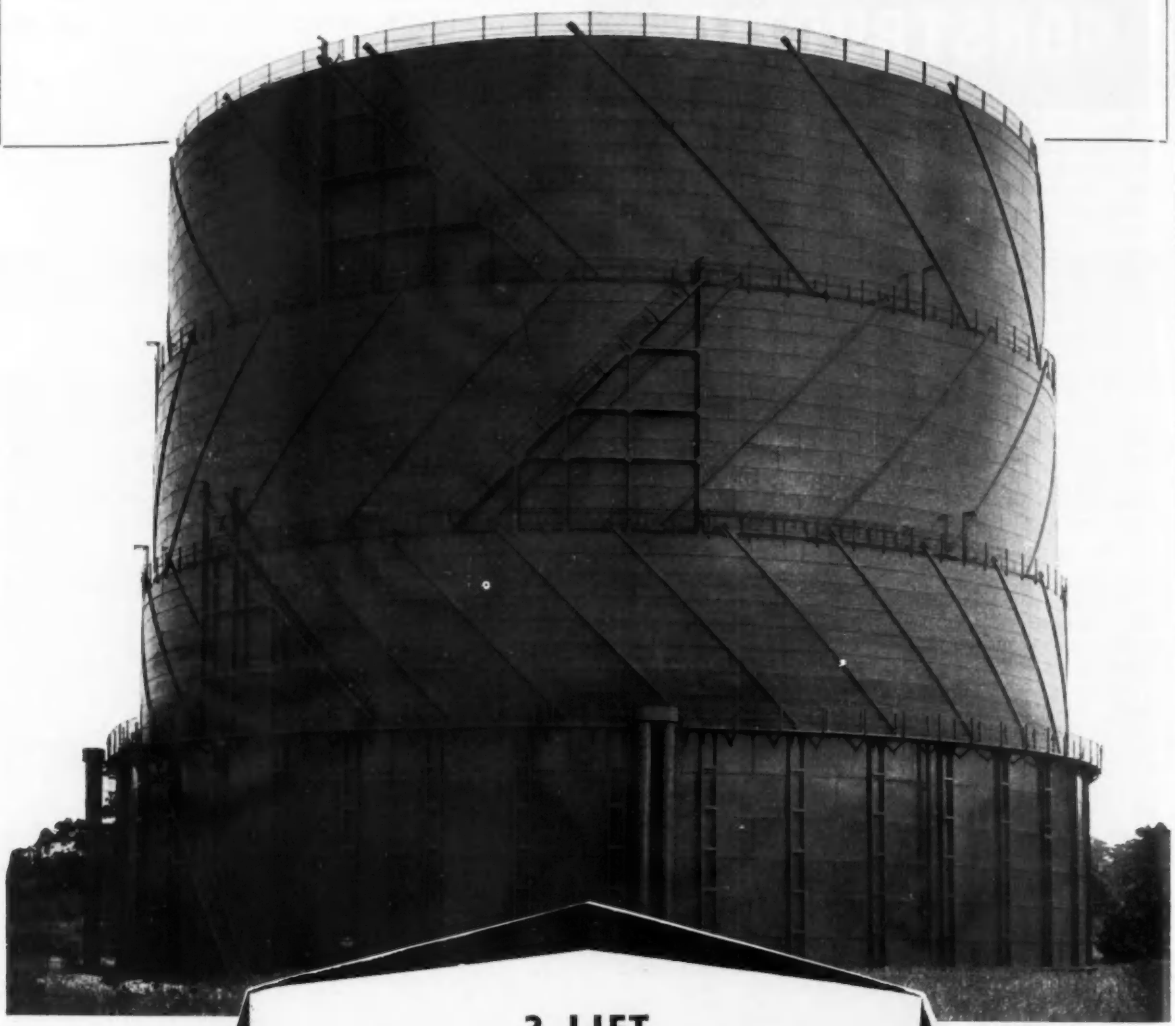


WOODALL-DUCKHAM
CONSTRUCTION COMPANY LTD

Woodall-Duckham House, 63-77, Brompton Road, London, S.W.3
Telephone: KENsington 6355 (14 lines) Telegrams: RETORTICAL (SOUTHKENS) LONDON

RECENTLY COMPLETED AT HORLEY, SURREY, FOR THE

SOUTH EASTERN GAS BOARD



3 LIFT

SPIRALLY GUIDED GASHOLDER

of 1½ million cu. ft. capacity, prepared for a 4th lift

Photograph by courtesy of the South Eastern Gas Board

1855 1956

DE DEMPSTER ELLAND

ROBERT DEMPSTER & SONS LTD

ELLAND YORKSHIRE

LONDON OFFICE: 57 TUFTON STREET · WESTMINSTER · S.W.1

MR. A. R. MYHILL, F.R.I.C., M.Inst.Gas E., M.Inst.F., says:

Preparing a Technical Report Requires Special Qualities

THE drafting and presentation of a technical report represents the final stage of an investigation, and is intended to summarise the findings, either completely, or up to a definite stage. In the latter case it is more properly termed a progress report.

A salient point about a technical report is that it is intended to be read by someone who, while not having partaken of the work involved, is, nevertheless, interested in the findings. Consequently, its preparation requires special personal qualities over and above those relating to scientific knowledge and technological skill. In preparing the report, therefore, one of the most important factors is the realisation of exactly what is wanted. Broadly speaking, the investigations may be divided into two classes: (a) so-called "guarantee tests," which are generally straightforward, with the object of determining whether a given appliance, plant, or material is capable of performing specified duties or producing specified amounts of products, and (b) special investigations or applied researches, which may include, among other things, trying out new processes, determining the effects of modifications to existing processes, or tracing the cause and applying the remedy for poor results. The first class includes tests specified in contracts between supplier and user, and, in many cases can be very simply carried out by conforming with an agreed code of practice. The present notes are, however, concerned mainly with special investigations of the second class.

Simple Answers

However interesting the subject may be to the scientific engineer, when the matter is related to an industrial problem, it is generally the case that only relatively simple answers are required to definite questions, as, for example, a direct "yes" or "no," a statement of pros and cons, a single figure giving consumption or production per unit of plant, time, or material, a products or energy balance sheet, or a statement of plant economics. The recipients of the report are often non-technical or semi-technical men, and it is useless in such cases, and, indeed, often harmful, to enter too deeply into technical or scientific issues. On the other hand, if the report is intended for presentation to a scientific society or other learned body, full technical details may be desirable, and opinions and conjectures may be welcomed. The first step, therefore, is to put oneself in the position of the person for whom the report is being prepared.

In a large industrial concern, the work should be the responsibility of a senior official who must be capable, not only of carrying out the tests, or directing the course of procedure, but also of closely criticising the results obtained, advising on the practicability of suggestions or proposing alternatives. It is important that his status should be respected, and he must be in the full confidence of those who are engaging his services.

His viewpoints should be unrestricted, even though unconventional, and he should be allowed the utmost amount of freedom. He should be present at all conferences relating to the question in hand, and should be allowed to hear all discussions, and would be expected to criticise and offer suggestions. Only in this way can his services and his special qualifications be utilised to the full. His terms of reference should be explicit, and he must be left in no doubt as to what is wanted.

The method of presenting conclusions is of the utmost importance. In reading through reports of various scientific and technical societies, a very considerable diversity of method is noticeable. Thus, some workers present their thesis almost chronologically, and, while they may succeed in making it easily readable, it is sometimes difficult to assess the relative importance of the different factors. The non-technical reader in particular, is likely to be lost in a maze of preliminaries before the conclusions are stated, and may well be excused if he becomes impatient to know when his questions are likely to be answered.

A much better plan is to give answers to these questions at as early a stage as possible, and to give arguments and supporting data afterwards, so that those readers who are interested in the findings only and who may not be technologically minded, will not need to read laboriously through parts which do not affect themselves.

A good report may be divided into a number of sections, arranged according to the information required, and the mental outlook of the person for whom it has been prepared. For any type of reader, two sections are essential, and the remainder are of value to the technical mind. The two essentials, in order of presentation, are:—(1) A clear statement of the objects of the report; (2) a list of conclusions drawn from the results and experiences gained in the course of the investigation.

A good report, giving all the essentials required by non-technical readers, and, at the same time, providing full technological details needed by the specialist, can be built up on the following lines: As an example, not necessarily rigidly adhered to in all cases, the report may consist of five sections, the first two being as stated in (1) and (2) above. Section (3) may describe, in detail, the general method of conducting the enquiry, the appliances used in testing, the lay-out of plant, etc. Section (4) will be an exposition of the arguments which show how the conclusions are arrived at from the data obtained, while Section (5) will consist of a list of data, both primary and calculated. Such data may be in tabular and/or graphic form.

It often happens that investigations of this nature lead to side issues, or suggest lines for further enquiry. Where this is the case, it may be advisable to include a short additional section or addendum, with the object of stimulating interest in directions where further information might prove useful.

Avoid Unnecessary Information

In regard to the amount of data which should be included, it must be borne in mind that, while all necessary information must be given, much more will have been obtained which may not be required by the terms of reference. The temptation to over-burden the report with details should be resisted. As an example, specimen calculations may often be included with advantage, in cases where they assist the reader to understand how the final figures were obtained from the primary data, but they should be given as specimens only, and where a mere substitution of figures in a framework or formula is all that is necessary, repetition should be avoided. Original data, such as hourly readings, are not usually given except in cases where it is desired to show the extent of variations, in which case time graphs will generally show up what is needed in a clearer way than tabulated figures.

Where calculations are possible by several methods, the method adopted should be clearly stated, as should also be the values, and authorities for, all physical constants. In this way it is possible for any interested person to make his own calculations relative to other conditions, either real or hypothetical, and to make comparisons with cases outside the scope of the original work.

The whole report should be prefaced by a simple table of contents showing the sections and, if desired, the sub-sections, boldly displayed, so that the reader can see, at the outset, the main points in which he is specially interested. If the report is a long one, it is also very convenient to include a fairly comprehensive page index to specific details at the end.

An interesting sidelight on matters relating to the production

(Continued on p. 608)

The NEW WORLD

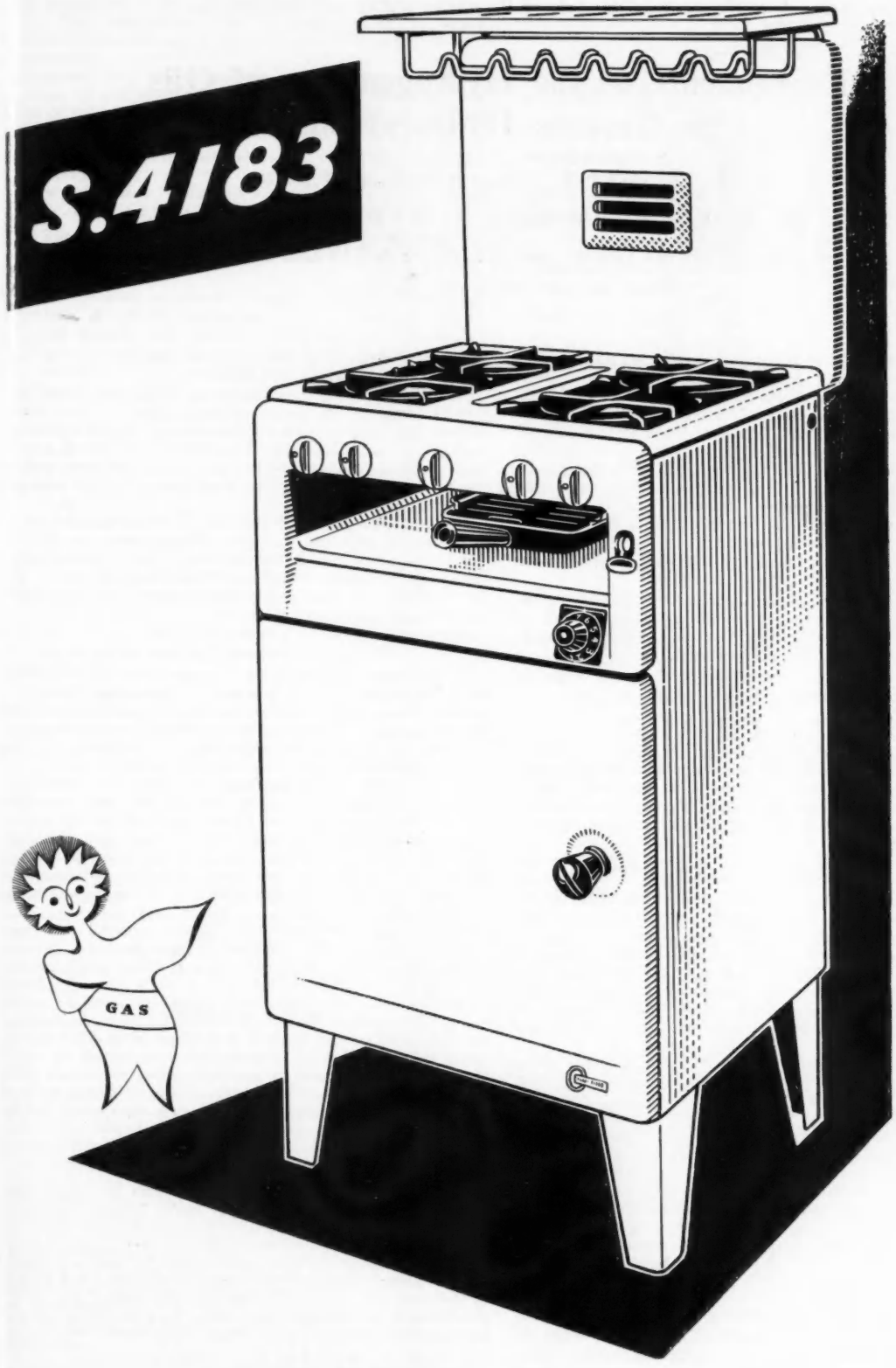
"Still the best value on the market today"

The most famous name in Gas Cookers

recommend

NEW WORLD

PRODUCT OF Radiation Ltd.



RADIATION GROUP SALES LTD., 7 STRATFORD PLACE, LONDON, W.1 TEL: MAYFAIR 6462

From the paper presented to the 22nd I.G.E. Autumn Research Meeting on November 20.

Experiments on the Hydrogenation of Oils to Gaseous Hydrocarbons

By F. J. DENT, D.Sc., M.Inst Gas E., F.Inst.F.;
R. F. EDGE, B.Sc.(Eng.); D. HEBDEN, Ph.D.;
F. C. WOOD, Ph.D. and T. A. YARWOOD, B.Sc.

Midlands Research Station, The Gas Council.

GASIFICATION processes require gaseous hydrocarbons for enrichment purposes and, in present circumstances, petroleum oil is probably the cheapest source. For the pressure-gasification processes under development at the Midlands Research Station, it is advantageous for the gaseous hydrocarbons to be produced under pressure, and obtaining them by the hydrogenation of oil is therefore being investigated. As usual, pressure will allow plant units to be of high capacity, while the hydrogenation reaction should be of assistance with crude and residual oils that deposit carbon when decomposed at atmospheric pressure.

The experiments are being made with two applications in view, *viz.*:—

(*a*) The production of gaseous hydrocarbons for the enrichment of the gas obtained by the gasification of coal in Lurgi generators; the calorific value is otherwise rather low at about 400 B.Th.U. per cu.ft.

(b) The production of gaseous hydrocarbons for pressure-gasification processes that use oil as the sole raw material.

Both applications permit of several arrangements: For example, in the Lurgi process, the gas made contains up to 65% of hydrogen, and part or all of it could be used directly to hydrogenate oil. Alternatively, the oil could be hydrogenated with gas produced separately by the gasification of more oil, supplemented perhaps by Lurgi tar or any tar from the oil hydrogenation.

Methods of Gasification

Thus, first a gas rich in hydrogen is produced by the gasification of part of the oil in steam and oxygen, and then this gas is used to hydrogenate the remainder to give a final gas of the desired calorific value. Alternatively, all the oil can be hydrogenated and the hydrogen-rich gas obtained by reforming part of the methane-rich gas with steam. The heat requirements for reforming can be liberated internally by means of oxygen, or supplied externally, for example, by the combustion of tar.

For the present investigations, an important aspect of these several arrangements is that they call for widely different performances from oil hydrogenation. With some, where the hydrogen produced is used directly in the process, it may be desirable for the hydrogenation to approach completion since there is little or no outlet for tar in the process itself. Others are less exacting in providing an outlet. In particular, where a gas rich in hydrogen is produced by gasification of some of the oil, since the demand of the oxygen/steam gasifier would be equivalent to 50% of the total oil supplied, not more than 50% of the total oil must be converted to gaseous hydrocarbons. Up to 50% of tar could, therefore, be accommodated, and any workable hydrogenation process would operate within this limit.

There are also differences in the nature of the oils likely to be used. A Lurgi plant, for example, if sited inland, might be supplied with light distillate or heavy fuel oil, while a large installation gasifying oil might be required to consume crude oil. With crude oil, a preliminary step might be to make a rough separation into distillate and residual fractions and, since the processes would make available a supply of hydrogen-rich gas under pressure, there would be the possibility of modifying the properties of any type of oil by means of a preliminary treatment. Refinery gases might be available to an oil-gasification plant near to a refinery.

With the intention of developing processes that would deal with all types of oil, and to enable a choice to be made between the various process arrangements, the first research problems were to determine the readiness with which oils as received could be converted into gaseous hydrocarbons and to obtain some indication of the design of the plant required for the purpose.

The technique being adopted for the hydrogenation is to supply the oil to a bed of carbon particles that is at 700° to 900°C. and fluidised with a hydrogen-rich gas at 20 to 50 atm. During the reactions, the oil molecules break down with the direct addition of hydrogen to give saturated gaseous hydrocarbons.

$$C_nH_m + H_2 \rightarrow C_nH_{2n+2}$$

Oil Hydrogen Saturated gaseous hydrocarbons

The exothermicity is such that, on the large scale, reaction temperatures could be maintained by preheating the hydrogenating gas to 300° to 600°C., e.g., by heat exchange with the outgoing gases. The gaseous hydrocarbons leave in admixture with unreacted hydrogenating gas to give a final gas of at least the calorific value of town gas.

The functions of the fluidised bed are: To maintain a uniform temperature throughout the reaction space, to receive any ash in the oil and also to act as a support for hydrocarbon constituents that do not vaporise completely. There is then more opportunity for these constituents to be hydrogenated, or, if this does not occur and they carbonise, the carbon is in a particulate form that can readily be withdrawn and utilised.

Since earlier experiments had shown that all the combustible constituents of coal could be hydrogenated to gaseous hydrocarbons, it appeared unlikely that there would be any problem in obtaining high yields from oil, in spite of notable differences in the conditions under which the reactions would occur. The greatest difficulty was expected to be in avoiding agglomeration of the fluidised bed when using oils such as crude and residual oils. Because the assessment of this difficulty could not be made by laboratory experiments, and since overcoming it was likely to depend upon plant design, the preliminary experiments on oil hydrogenation were made on the pilot-plant scale.

Pilot Plant

The pilot plant available was that which had been used at Poole for the hydrogenation of coal. It had a principal reaction vessel of 2 ft. 6 in. diameter containing an insulated liner of heat-resisting steel of 11¼ in. diameter. There was an electric winding on the liner, which could be used to counteract heat losses. Initially, the distance between the end flanges of the main vessel was 12 ft., but was later increased to 22 ft. 200,000 cu.ft. of hydrogen, 95% pure, were available per day and could be preheated in a salt bath up to 550°C. The whole plant could be operated up to a pressure of 35 atm.

The fluidised bed, usually about 9 ft. deep, was contained in the liner and it was found that the bed was best supported on an inverted conical base, with the hydrogenating gas supplied at the apex of the cone where the oil was injected. See Figure 1. On a large plant, the fluidised bed would probably consist of powdered carbon produced from the oil, but, in

these experiments, it was of gas works coke crushed to below ⅛ in. There were baffles in the bed to prevent surging, and a multi-point thermocouple indicated the uniformity of bed temperatures.

Preliminary experiments with these arrangements at pressures of about 30 atm. confirmed the possibility of obtaining high yields of gaseous hydrocarbons from the various types of oil and provided the following information:

(1) The most desirable temperatures for hydrogenation were between 700° and 900°C.; below 700°C., the reaction was too slow, while above 900°C. tar vapours tended to crack and form soot.

(2) The fluidised bed gave satisfactory control over the reaction temperature and appeared to retain the ash of the oil.

(3) It was most important to obtain a thorough mixing of the oil with the hydrogenating gas. If the oil entered the fluidised bed without mixing, contact with the hot powdered coke led to rapid thermal decomposition before the hydrogen could exert its effect.

(4) While there were no difficulties when using light distillate or gas oil, agglomeration and caking could be serious with crude and particularly with residual oils. With such oils, pea-sized agglomerates formed within the fluidised bed and there was caking on the inside wall of the reaction vessel, mostly near the point of oil admission. It may be that this was the result of using a fluidised bed of relatively small diameter in relation to its depth, and it would perhaps have been less in evidence with a wider bed in which there would be more rapid recirculation of the fluidised particles, but, after several experiments, it became plain that, in order to obtain satisfactory results in the pilot plant, some special steps would be necessary to prevent caking when using crude and residual oils.

(5) While for convenience it was customary to use the electric winding on the liner for heating the fluidised bed to reaction temperature and, in some cases, for maintaining it, there was no difficulty in raising and maintaining temperatures by the internal combustion of the preheated hydrogenating gas with air. It was found desirable, however, to admit the air so that there was no opportunity for tar vapours to be cracked by contact with the hot flame.

Following the preliminary experiments, the plant was modified as required, and observations were made under steady conditions over longer periods. The tests have been on light distillate, gas oil, crude oil and heavy fuel oil. In all cases, the pressure has been 32 atm. and the hydrogenating gas of about 95% purity, *i.e.*, the partial pressure of hydrogen has been 30 atm. The use of other pressures and the influence of diluting the hydrogen with other gases are to be investigated later.

Description of Plant

With light distillate, tests were made in which the calorific values of the gases produced were 580 and 863 B.Th.U. per cu.ft. There was no tendency for agglomeration and the only precaution needed was to obtain the thorough mixing of the oil and hydrogenating gas. The distillate was therefore vaporised and added to the hydrogenating gas well before the reaction vessel.

In these tests, it was convenient to demonstrate that, with heat recuperation, the hydrogenation reaction was sufficiently exothermic to maintain reaction temperature, and, accordingly, heat exchange was incorporated between the ingoing and outgoing gas. In this arrangement, after leaving the salt bath preheater, the mixed gas and oil vapour was piped to the top flange of the reaction vessel, through an internal heat exchanger, and then down through the fluidised bed to the apex of the conical base. By this procedure, the gas-vapour mixture was fully preheated to the temperature at which reaction commenced.

Under these conditions, it was found that, even in the pilot plant, no electric heating was required to maintain temperatures, and, indeed, it was necessary to restrict the rate of oil supply to prevent them rising too high. During the first test (No. 38), this limited the calorific value of the gas produced to 580 B.Th.U. per cu.ft.

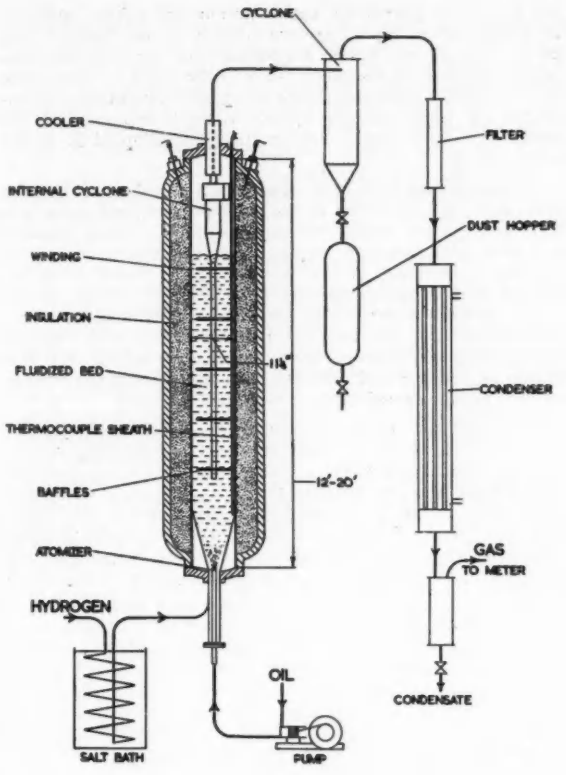


Fig. 1. The arrangement of the pilot plant for the preliminary tests on the hydrogenation of oils under pressure.

The internal heat exchanger had, therefore, to be eliminated for the second test (No. 41) at the higher calorific value, the mixture of gas and oil vapour then being taken directly from the salt bath preheater to the apex of the cone. In this case, it was the capacity of the salt bath preheater that limited the amount of oil supplied. Nevertheless, the outlet gas reached 863 B.Th.U. per cu.ft., with 5.2 gal. of oil being supplied per 1,000 cu.ft. of hydrogenating gas.

Experience prior to this test had shown it to be important to avoid an unduly large space above the fluidised bed, since, otherwise, reaction, continued outside the temperature-controlling influence of the bed, with the formation of soot. Thus, when the internal heat exchanger was removed, the fluidised bed was deepened and a cooling coil inserted above the top baffle.

Although gas oil is unlikely to be freely available for gas making, a pilot-scale test was carried out as a useful comparison with laboratory experiments. The plant arrangement incorporated heat exchange with the outlet gas, and no electric heating was used on the liner. Conditions were, in fact, identical with those of test 38 on light distillate, and, as before, the oil supply had to be restricted to prevent the reaction temperature from rising. This determined the calorific value of the gas produced, *viz.*, 559 B.Th.U. per cu.ft.

Use of Crude Oil

The principal difference in behaviour between gas oil and light distillate was that the gas oil produced an appreciable proportion of condensate, presumably arising from its aromatic constituents.

The preliminary experiments on the hydrogenation of crude oil had indicated that, with crude and residual oils, special steps were required to prevent agglomeration and caking, in addition to obtaining as thorough contact between oil and hydrogen as possible. Obtaining thorough contact with oils that could not be evaporated completely required them to be atomised into a conduit that confined the flow of hydrogenat-

ing gas, while preventing agglomeration and caking appeared to depend upon improving recirculation in the fluidised bed, so that the oil was better distributed over the coke particles. Modifications were therefore made to the plant to meet these requirements, a governing factor being that circumstances necessitated the whole reaction system to be incorporated in the existing pressure-vessel. The arrangement adopted is shown in Figure 3.

On test, it was found that the recycle of coke satisfactorily prevented agglomerations in the fluidised bed, and there was little evidence of caking, but in periods that varied between two and 24 hours, the recycle became unstable and then stopped. The cause of this was eventually traced to an increased back pressure resulting from incipient caking on the surface of pipe A near to the oil atomiser, and, after considerable experiment, the conclusion was reached that smooth operation required the oil to be injected in such a way that droplets could not make contact with any part of the surface of the reaction vessel while still liquid.

It was difficult to meet this condition on the relatively small pilot plant in which the atomiser was, from necessity, within two to three in. of a surface. Clearly, it could not be satisfied when the oil was injected into the $\frac{1}{8}$ in. pipe A. It was also insufficient to raise the atomiser to the apex of the cone, since there was still direct access to surface below the fluidised bed. Raising it still further into the bed lost adequate mixing with the hydrogenating gas. The difficulty was finally overcome by having the atomiser at the top of pipe A, and broadening the apex of the cone so that the oil spray was surrounded by fluidised material. Up to 10% of the hydrogenating gas was used as a subsidiary supply to maintain the fluidisation.

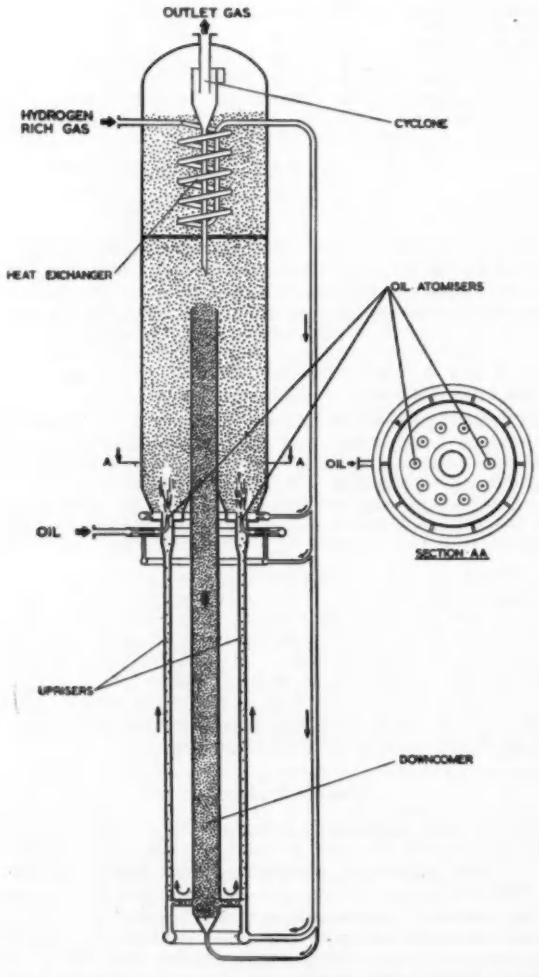


Fig. 2.—Diagram showing a possible arrangement for large-scale hydrogenation unit employing the coke recycle system, with a number of atomisers surrounding a central downcomer.

Two tests were then carried out with crude oil, one with temperatures in the coke recycle between 765° and 790°C, and the other with them between 780° and 820°C. The inert free calorific value of the gas made was approximately 600 B.Th.U. per cu.ft. in both cases. During the first test, pitchy constituents of the condensate being produced from the crude oil required frequent changing of the filters in the gas stream. For the second test, both cyclone and filters were replaced with a scrubber in which the condensate itself was recycled to quench the gas.

Tests have now been started on the hydrogenation of heavy fuel oil (3,000 sec. Redwood No. 1) using the same plant arrangement as for crude. So far, the gas produced has had a calorific value of 500 B.Th.U. per cu.ft., and there has been no difficulty with agglomeration and caking. Further tests will be at higher calorific values.

In enriching a hydrogenating gas of approximately 300 B.Th.U. per cu.ft. to 500 B.Th.U. per cu.ft., the amount of oil injected per 1,000 cu.ft. of gas has been twice that required to enrich Lurgi gas from 400 to 500 B.Th.U. per cu.ft., and four times that required to enrich it to 450 B.Th.U. per cu.ft.

The Construction of the Pilot Plant

On the pilot plant the internal surfaces of the reaction vessel have consisted entirely of mild or heat-resisting steel. In the experiments on light distillate and gas oil, using a simple fluidized bed, the surfaces remained clean and there were no signs of abrasion. The metal became extremely hard, however, presumably due to the carburising effect of the hydrocarbons.

Serious abrasion was expected in the experiments on crude and heavy oil, in which coke dust was recirculated at up to 50 ft. per sec. It did not, however, occur, and in recent runs heat-resisting steel has been replaced by mild steel even for the $\frac{1}{8}$ in. pipe A.

With oils high in sulphur, there has been appreciable scaling of the steel, but this has not seriously interfered with experimental work. It is not, of course, suggested that a similar steel construction should be used on the large scale.

In the pilot-scale tests, the hydrogenation of oils other than light distillate was incomplete, but the performances obtained are, nevertheless, adequate for oil-gasification processes that provide an outlet for unreacted material, *e.g.*, as fuel for an oxygen/steam gasifier or a methane reformer; they would not prevent the thermal efficiency of gasification reaching 75 to 80%.

Even so, the fact remains that test conditions were limited by the use of an existing pressure-vessel, and there is little doubt that hydrogenation would have been more complete if the fluidised bed had been deeper and if higher pressures had been used. At the higher pressures, higher temperatures would also have been of assistance, but, with pressure limited, higher temperatures tended to give rise to soot formation.

Plant Details

In the light of the test results, a larger pilot plant, with a capacity of one mill. cu.ft. of gas per day, has been designed and is now being constructed. It will allow the fluidised bed to be 20 ft. deep and the pressure to be up to 70 atm. This pressure may not be necessary, but is desirable for experimental work.

The hydrogen available for the pilot-scale tests amounted to approximately 200,000 cu.ft. per day. When supplied to the reaction vessel under pressure, it gave a linear gas velocity up the vessel of 0.4 ft. per sec., a convenient fluidising velocity. Operating with the same velocity, a large vessel of 10 ft. internal diameter would have a throughput of 23 mill. cu.ft. of gas per day.

A speed of 0.4 ft. per sec. is not, however, maximum fluidising velocity, and one ft. per sec. or more could be used. At one ft. per sec., a 10 ft. vessel would have a throughput of 57.5 mill. cu.ft. of gas per day, or 90 mill. cu.ft. per day if the pressure were increased to 50 atm. It is evident, therefore, that commercial hydrogenation units could be of very high capacity.

Fifty mill. cu.ft. per day would require the injection

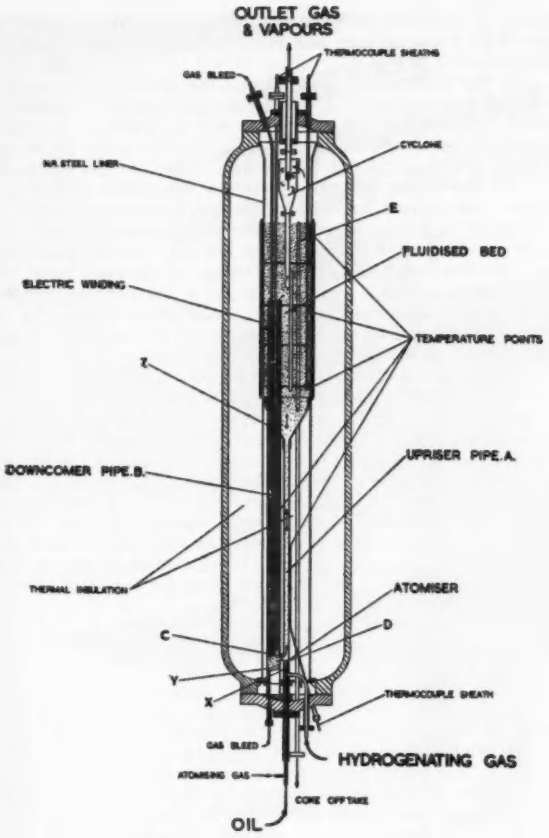


Fig. 3.—The arrangement of the reaction vessel for the tests on crude oil and heavy fuel oil, showing coke recycle system.

of some 150,000 gal. of oil per day, i.e., approximately 100 gal. per min., and it is difficult to imagine such a supply passing through one atomiser. Because of this, it is thought that a large unit using coke recirculation would have a number of atomisers. It might, for example, have a central down-comer for the coke, with a number of oil atomisers in the annulus surrounding it. (Figure 2.)

As already indicated, the condensates were remarkable in consisting of a mixture of a relatively few parent aromatic hydrocarbons. They contained no paraffinic or unsaturated aliphatic compounds, the hydrocarbons present being mainly benzene and naphthalene, with smaller amounts of anthracene, fluorene, phenanthrene and other multi-ring compounds. When using gas oil, more than 60% of the condensate consisted of benzene, but with heavier oils the proportion of multi-ring compounds increased.

Because of their nature, separation of the condensates into constituent hydrocarbons was relatively easy and, for example, during distillation, 90% or more of the benzene was usually obtained within 0.1°C., while the naphthalene fraction set to a hard crystalline mass approaching white in colour. Containing no unsaturated compounds, the benzene remained water white and free from gum over long periods and, but for its sulphur content, would probably have reached synthesis-grade purity. As distilled, however, the benzene from the gas oil contained 0.07% of sulphur, those from crude oil, 0.24% (test 50) and 0.07% (test 52), and that from the fuel oil, 0.49%. The sulphur was entirely in the form of thiophene. The reduction obtained in test 52 as against test 50 is noteworthy and probably due to the higher temperature in the fluidised bed. On a pressure-gasification plant with hydrogen-rich gas available, it could, of course, be readily removed by a catalytic treatment.

It can be assumed that there will always be an outlet for benzene as motor fuel or for chemical purposes. There is also an expanding market for naphthalene. There then remains little of the condensate for disposal. As a percentage of the initial oil, the residue would be 2.2% with gas oil, 7 to 9% with crude oil, and 12.3% with heavy fuel oil, with the possibility of reduction by using higher pressures, temperatures, etc. The residue could be sold as tar, but, alternatively and depending on the nature of the gas-making process, it could be used as boiler fuel or as a fuel for the reformer, or it could be gasified in oxygen and steam. A further possibility is to return it for a second hydrogenation treatment.

Aromatic Compounds in Condensate

It appears that the parent aromatic compounds that make up the condensate arise mainly by the hydrogenation of side chains from the more complex aromatic compounds present in the original oil. Strong evidence for this view was obtained from laboratory experiments on gas oil at 700°C. This temperature was rather low for the complete hydrogenation of the side chains, and the condensate collected contained considerable proportions of compounds such as toluene and xylene, but little benzene.

Carbon is accepted as a product of the thermal decomposition of hydrocarbons and, in so far as the rejection of hydrogen from hydrocarbon molecule is involved, its formation is the reverse of hydrogenation. Nevertheless, thermal decomposition can occur rapidly in the temperature range of 700° to 900°C., which is used for hydrogenation, and, indeed, it is probable that hydrogenation follows the appearance of thermal instability in the hydrocarbon molecule. Whether or not carbon is produced, however, depends entirely upon the relative rates of the decomposition and hydrogenation reactions. Equilibrium considerations are of secondary importance since, although final equilibrium would in many cases require the more complex hydrocarbons to deposit carbon, in the presence of several atmospheres of hydrogen, a partial equilibrium is in favour of their conversion to methane. There is no reason against the attainment of the final equilibrium through the mechanism of methane formation.

Carbon Deposition

Carbon deposition can, however, occur from the vapour phase if the vapours are aromatic in character, and, at temperatures approaching 900°C., it appears to take place with appreciable velocity from those that give rise to condensate. The decomposition is more noticeable when the relative concentration of vapour to hydrogen is high as a result, for example, of a high rate of oil injection, or of the use of a heavier oil. When aromatic vapours are present and the pressure is about 30 atm., it is advisable to avoid temperature exceeding 850°C.

There is, however, the possibility of modifying heavy oils by pre-treatment, and liquid-phase hydrogenation processes for their conversion to light oils have found extensive application on the large scale, both with and without catalysts. They normally operate at high pressures and lower temperatures than have been used in the present investigation for the production of gaseous hydrocarbons. If, however, some such process could be effective during the preliminary preheatng of the oil and hydrogen, both carbon deposition and the tendency for agglomeration in the fluidised bed would be reduced. On the other hand, agglomeration is no longer a serious difficulty and deposited carbon can be withdrawn in a useful form. A preliminary treatment of the oil would, therefore, only be justified if it involved little expense. It is a matter for further investigation.

The Use of Hydrogenation for Enrichment

The gas produced by the Lurgi process from bituminous coal requires the adjustment, not only of its calorific value, but also of its specific gravity, typical figures being: Calorific value, 410 B.Th.U. per cu.ft., and specific gravity, 0.38. Previously, the catalytic synthesis of methane from carbon monoxide, in the Lurgi gas itself had been proposed as a method of enrichment, but now there is the alternative of oil hydrogenation. The specific gravity of the gas can be increased conveniently by adding nitrogen from the oxygen plant.

In comparison with catalytic methane synthesis, oil hydrogenation has the advantage of enrichment being accompanied

by an increase in the thermal yield of gas. Because of this, the addition of nitrogen to adjust specific gravity is beneficial in so far as the extra enrichment then required is accompanied by a correspondingly greater output. Indeed, this possibility can be exploited by applying carbon monoxide conversion to the Lurgi gas so as to lower its density still further, and the figures in Table 1, in which output = 100 for enrichment by catalytic methane synthesis, illustrate the case when the final gas is to have a calorific value of 450 B.Th.U. per cu.ft. and a density of 0.5. It is seen that the output with oil hydrogenation can be 50% greater than with catalytic methane synthesis.

TABLE 1.—THE INFLUENCE OF VARIOUS METHODS OF ENRICHMENT ON THE OUTPUT FROM A LURGI GASIFICATION PLANT WHEN ADDING NITROGEN TO ADJUST THE SPECIFIC GRAVITY OF THE GAS PRODUCED.

Method of Enrichment	Without Enrichment	Enrichment by Catalytic Methane Synthesis	Enrichment by Oil Hydrogenation	
			(*a*) Without CO Conversion	(*b*) With CO Conversion
1	2	3	4	5
Calorific Value (B.Th.U. per cu. ft.) ..	410	450	450	450
Specific Gravity (air = 1)	0.38	0.50	0.50	0.50
Gas Composition—				
CO_2	2.0	4.1	1.8	1.5
C_xH_y	0.4	0.2	0.4	0.3
CO	22.6	14.8	20.3	3.8
H_2	60.0	42.2	42.4	39.4
C_nH_{2n+2}	14.2	26.6	24.2	30.6
N_2	0.8	12.1	10.9	24.4
	100.0	100.0	100.0	100.0
Output of Gas ..	116.3	100.0	129.6	152.6

Similar considerations apply to the operation of hydrogenation in oil-gasification processes, and, since all such processes are likely to incorporate the conversion of carbon monoxide, the final gas will have to contain considerable amounts of nitrogen. It can be shown that, if the final gas is to have a density of 0.45 to 0.5 and a calorific value within the town gas range, the calorific value prior to the addition of nitrogen must be 600 to 620 B.Th.U. per cu.ft. It is for this reason that the hydrogenation tests have been carried out at rather high calorific values.

DISCUSSION

Mr. G. le B. Diamond (Chairman, West Midlands Gas Board) opened the discussion. He said he was deeply interested in the valuable results achieved because they came into line so well with their own ideas for the enrichment of gases produced by the high pressure gasification process. 'I will go so far as to say that the result of the research here displayed is the most important project that has been before the gas industry since Professor Cobb enunciated the influence of the ash constituents in the carbonisation and gasification of coal in 1926 and Dr. Dent gave his paper on the production of gaseous hydrocarbons by the hydrogenation of coal.'

Dr. Dent and his colleagues had shown in this paper that the gasification of primary flash distillates was the least difficult of all. Moreover, gas oil and heavy fuel oil had been hydrogenated in such a manner that the process could be used either for the enrichment of the gas obtained by the gasification of coal, or as a basis for the gasification of oil. 'I think the next step forward is the construction of a full-scale unit for the enrichment of Lurgi gas rather than the conditioning of lean gas manufactued from oil. The international situation emphasises what I have said, for it is surely better to make use of our low grade weakly coking or non-coking coal for gasification rather than placing so much reliance on oils from the Middle East.

'In this country in the past our principal gasification process has been the carbonisation of coal in retorts supplemented by the water gas process. It has served us well and has enabled some measure of control to be applied to gas production and coke manufacture according to the demand, but we have all been well aware of the difficulties which could be brought about with the distribution of a high percentage of water gas and the resultant increase in specific gravity. Oil hydrogenation, however, can be used to bring the Wobbe index of Lurgi gas into line with that of the gas we supply in the West Midlands area and at the same time give an increase in output.

'In the summary it is stated that the gas is low in organic sulphur compounds, and this presumably applies when using crude oils and fuel oils which are high in sulphur. I cannot, however, find any further information on this point in the test results, and I would like to know the basis for this statement.

'We know very little yet about the economics of this process in comparison with other processes for the gasification of oil which we now have, and the chemical engineering problems involved have not yet been worked out and may be formidable.

'The circumstances and the timing of the tests have not favoured long period runs, and I doubt whether the abrasive influence of coke dust has really made itself felt, so that it really needs some long period runs to be sure that this hazard has been eliminated.

'From the economic angle, the great advantage of using the hydrogenation process with oil depends on the yield of aromatic hydrocarbons, and the samples of these products which I have seen at Solihull have much impressed me. The benzene which is water white, remains so during months of storage, and there is not the slightest trace of gum in it. The naphthalene, too, which is obtained by distillation, appears to be of very high quality, but it is to be regretted that the highest yields of these products were obtained from gas oil and the heavier oils and not from the light distillate, which we are likely to be able to get. The yield from this is comparatively negligible.

Use of Oils from Other Oilfields

'Perhaps Mr. Dent would enlarge on how he thinks these aromatic hydrocarbons are obtained and whether there is any possibility of increasing the yield from light distillate.

'These tests have all been carried out with oils which originated in the Middle East, but, since we may have to use oils from other origins, particularly those which are high in residual fractions and perhaps in sulphur, I wonder what evidence there is that these processes will be applicable to these oils also.'

Sir Charles Ellis (Scientific Adviser, the Gas Council): 'I do think it is worth careful consideration whether the detailed experiments, particularly those represented in the Appendix, should not be written up in greater detail and published as scientific papers in the appropriate journals. There is a wealth of material there that would be of benefit to a wide range of scientists and to this industry.

'From the operation of the processes and the description Dr. Dent has given, control appears to be by four parameters. First, there is the rate at which the oil is supplied, secondly, the ratio of the oil to the hydrogen, thirdly, the temperature or average temperature of the reaction space, and lastly, there is the residence time in the reaction zone. For any given vessel and construction these reduce to three, because a given throughput, and size, mean a given residence time.

'In what way did these parameters determine the constitution of the gas? How did Dr. Dent envisage the actual chemical processes, and how the manipulation of these processes could be used as a control? In other words, what were the views of someone actually inside the reaction vessel and, when he varies one of these parameters, particularly the ratio of hydrogen to oil or the residence time, how did he view the chemical processes which caused the change in the gas quality as he himself would observe it?

'As to the condensate, to which Mr. Diamond had already referred, you will notice that with the very light distillate in which the initial proportion of aromatics is small, as little as 0.3%, there is an appreciable yield of condensate in the product containing 84% of benzene. Crude oil and heavy oil, however, which contain initially a considerable proportion of aromatics, yield further quantities of condensates, in which is found only about 50% of benzene and the remainder are higher aromatics. This leads one to think that there may be two different processes.

'In the first case, where there are initially no aromatics there must be an actual synthesis in the process, presumably by radicals set free by the hydrogenation process, but in the latter case, some of the original cyclic compounds may continue to exist, but are possibly stripped of their side chains, and would account for the greater proportion of higher aro-

Also available with tall splash-back and plate-rack

Supported by big-space, powerful advertising
to over **15 MILLION WOMEN**

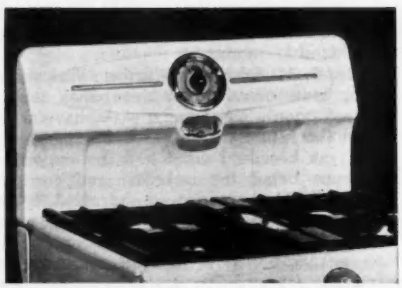
THE MAGNIFICENT NEW

Envoy

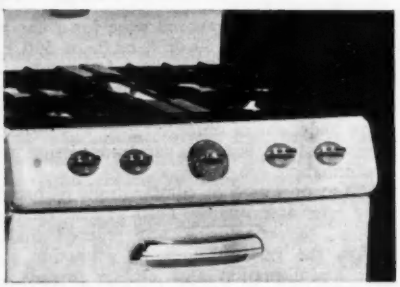
Show a **FLAVEL** First!

SIDNEY FLAVEL & CO. LTD., LEAMINGTON SPA TELEGRAMS: FLAVELS TEL: (SALES) 3091 AND 8700

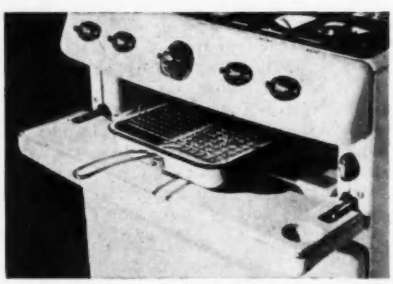
4 EXCLUSIVE ANGLES ON THE ENVOY



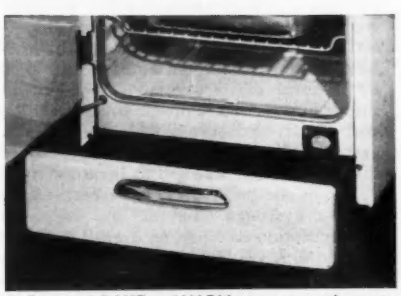
1. Ultra-modern short splash-back is fitted with a built-in long period timer. We haven't forgotten a place for the plates though — there is a large storage drawer under the oven, doubly useful for warming the plates gently while the oven is on.



2. Entirely new 'glide-over' hot-plate design gives safe, non-spill support for even the smallest milk saucepans. Streamlined press-turn safety taps,'with special LOW burning position, available in a choice of six colours, at no extra cost.



3. The grill is extra-large, and the grilling compartment has the new light-reflecting 'Ice-Blue' interior finish. The fall-door has been specially styled to give a smooth, absolutely level working surface when in the 'down' position.



4. Patented BAKE or WARM oven control; set to 'Warm', oven temperature stays well below 200° F ... *food cannot dry up.* Outsize 'Ice-Blue' oven takes 25 lb. bird easily; oven door, with stay-cool 'Plasti-chrome' handle, has studs for Flavel 'Handyrack'.

matics. It would be most interesting to know whether Dr. Dent considers this a suitable and fruitful subject for research.

'Dr. Dent gives the total exothermic heat balance as a percentage of the total temperature present there. Is this figure obtained by difference or directly by measurement? I rather gather the latter, but in any case, I wonder how dependable it is.'

Did this heat balance depend upon some conditions in the experiment or were those things really beyond the sensitivity of measurement? From the scientific standpoint, this was of considerable interest.'

Mr. E. M. Edwards (Member, Wales Gas Board): 'The developments described in this paper could, when successfully proved upon a commercial scale, have a fundamental influence upon the future of the gas industry. With colleagues of four area gas boards, I have had the opportunity of investigating in some detail the technical and commercial considerations arising from the processes described by the authors, and the purpose of these investigations was to examine alternative methods of the large-scale production of gas from oil and oil products. They included estimates of capital, operating and gas transmission costs, to enable the economics of the alternative schemes to be assessed with a reasonable degree of accuracy.

Schemes for Large Works

'The schemes prepared were for a complete new station for the production of 50 mill. cu.ft. of 500 B.Th.U. gas per day, interchangeable with normal town gas. The plants were required to process a wide range of feedstock, from P.F.D. gas oil and the lighter type of gasoline down to heavy fuel oil. The treatment of crude oil also was visualised, and the economics of long distance gas transmission were included in the examination.

'Ten processes or combinations of processes were examined and after assessing the costs at load factors of 70%, 90% and 100%, the conclusion was reached that the process which offers the greatest potential attraction in a combination of the hydrogenation and Texaco process.'

Mr. Edwards went on: 'A combination of hydrogenation and Texaco plants of capacity of 50 mill. cu.ft. per day of 500 B.Th.U. gas, operating at 90% load factor, when processing heavy fuel oil, would require annually about 290,000 tons. The yield of high grade benzene would be about 10,000 tons, and pure sulphur would be about 9,000 tons.

'The translation from pilot plant to large-scale commercial units will naturally present problems of design and operation. These will, of course, take time to solve.'

Mr. N. H. Williams (Humphreys & Glasgow Ltd.): 'This work on hydrogenation has as its basic idea the production of gas under pressure, and in order to assess its value it is necessary to consider why processes for pressure gasification should merit attention. The most important reasons are first, gas quality, second, the cost of gas production, and third, the ability to produce gas at a higher calorific value than is now customarily distributed.

Greater Domestic Demand

'The domestic gas demand would be potentially greatly increased if we could supply with no increase in price and continually, a really unexceptionable gas, low in carbon monoxide content, with an organic sulphur content of 3 grains per 100 cu.ft. or less and a controlled specific gravity. Such a gas can be made now by carbonisation of coal in suitable plant followed by removal of its organic sulphur content, but this organic sulphur cannot be removed without substantially increasing the cost of gas. Pressure gasification methods, however, give quite exceptional control of the quality of the gas produced, and it is possible to make gas to the most rigid specificaions.

'From the point of view of cost, experiments show that by making hydrogen from oil and supplying the hydrogen to a hydrogenation enricher, an overall thermal efficiency of approximately 70% could be expected for an entire works producing gas at 350 lb. per sq. in. This included the oxygen used in the gasification process and the power requirements. Oil prices, which were considered reasonable for bulk supply, gave a cheap gas.

'The process should be able to make gas of a higher calorific value to enable bigger gas loads to be put through existing local mains by increasing the statutory calorific value. The hydrogenation enrichment process gives promise of being able to achieve this with a considerable range of feedstocks.

'The production of gas independently of the production of solid smokeless fuel, and the high pressure at which the gas is produced must be considered together. It may be significant that although the two fuels, gas and coke, are usually manufactured at the same works, a modern development of the South Eastern Gas Board will result in the production of town gas from oil at a works which does not make coke but is located for easy access to oil supplies.

'Two points remain and these are first, that the gas industry is virtually the only industry which can use crude oil in bulk without any pretreatment which avoids the considerable thermal loss at the refinery, and secondly, the separation of benzene cannot be prevented. It is no longer a question of removing the benzene or not. There is no choice in the matter since the benzene separates out on cooling the gas at the high pressure, but it is unlikely that the market for benzene will be become saturated.'

Dr. J. R. Dewhurst (Senior Physical Chemist, South Eastern Gas Board): 'It is with some trepidation that I who am concerned with utilisation problems come up to comment on a paper which is so obviously concerned with production problems, but time after time this afternoon we have heard that the advantage of the process is that it gives gas of such beautiful characteristics and that the process can be used to yield a specification gas. The specification will have to be better than that indicated by Table 5*. This morning a paper was presented by Gilbert and Prigg on predicting combustion characteristics, and they made it quite clear (the point was corroborated), that it is not sufficient to have the calorific value and nothing else in the gasification plant.

'If one applies the calculations explained in the paper of this morning, to the gas in Table 5 which has had the CO removed by conversion, one gets a flame speed factor of 29. Plotting this on the diagram, it indicates that with quite a lot of appliances there will be trouble with lifting flames. That may not apply to the all appliances but in a number of appliances, gas burners will have flames which will not be sufficiently stable for safe use. The gas in column 4 which still contains the CO is better since it does give a point which comes inside the area of usability in the Gilbert and Prigg diagram.

Combustion Characteristics

'The explanation for the trouble that this gas can cause, even though it is inside the diagram, is that it still has a lower flame speed factor than is normal for gas of this type and seems to be of very low hydrogen content. Although the Lurgi gas is very rich in hydrogen, the addition of nitrogen and hydrocarbons has reduced it, as is the case of the gas with the fullest carbon monoxide conversion, to less than 40%, which is not sufficient to give a stable flame under the pressure conditions operating in these gas appliances.

'More attention should therefore be given to the properties of the gas other than the mere conventional ones of Wobbe number and calorific value.'

Mr. J. E. Davis (Chief Technical Officer, South Eastern Gas Board): 'The previous speakers in the discussion have covered most of the truly important points. I would, however, like to lay stress on the form of this report. We are used to reports from Dr. Dent and his team and we come to expect them. But in this particular report I was impressed with the pattern of the presentation. It might be useful to quite a lot of other people who are doing work of this kind to study its pattern.

'Dr. Dent over a number of years has spoken so much about the Lurgi and other gasification processes and it is all too easy to overlook that it was he who discovered the speed of the reaction between compounds of carbon (with coal and oil) and hydrogen under pressure to yield the stable hydrocarbon methane as a valuable end product, which has made this work possible and which gives us so much hope for new and very desirable types of processes. We do see the way to coal here, in that one can understand the coal hydrogenation picture by imagining these particles of coke for the fluidised gasifier exuding the oil from their own interior.

'This paper and all the work behind it would be utter waste

* Table I in the abstract published in the 'GAS JOURNAL'.

unless there were sufficient people to appreciate what this little research team are doing and why they are doing it. For more than 20 years the gas industry has maintained in operation a programme of work on gasification with the aim of establishing for the industry a greater degree of freedom—freedom in the choice of raw materials, and freedom from the domination of our economy by the markets for secondary products; not to destroy existing methods but to give greater variety.

'Reference has already been made to the much greater control which these processes are going to give in respect of gas quality, and I am glad that other speakers have pointed out how much better it would be if we could perhaps in time—though it will be in time—stop working to the values set up by the needs of customs of the past and distribute a gas consisting essentially of 60 parts methane and 40 parts hydrogen and not too much nitrogen (because that does not earn its keep), which would increase holder capacity by 50% and mains capacity by two-thirds.

Nuclear Energy to Help Methane Reformation

'Now that the work on unit processes is progressing so well and the thought of departing from tradition is less fearful than it was 20 years ago, we may be within sight of gathering some of the fruits of all this labour. It is that thought which emboldens me to make a remark so fantastic that it may take yet another generation to become respectable. I have already said that I think we shall want to work to a gas of calorific value higher than 450/500 B.Th.U. per cu.ft. A substantial proportion of the gross quantity manufactured will need to be recycled through that vessel marked "methane reformation" (see fig. 2 of the original text). In that vessel a strongly endothermic reaction will proceed, and the absorption of heat by an endothermic reaction, whereby that heat is removed as potential heat in the final product, would be a far more efficient way of absorbing the heat of nuclear reactions than the conversion of that heat into electrical energy, while—incidentally—at the same time greatly increasing the efficiency with which the decreasing supplies of fossil fuels could be used.'

Dr. G. E. Foxwell: 'Will the high-level people please give me the answer to the question as to what we are doing about the smokeless fuel problem?

'Mr. Edwards has given us a picture of an enormous works, really enormous, which from coal and oil will produce gas which he says we can transmit over long distances for very low cost. That is absolutely admirable. He stopped short of telling us at what price he was going to produce the gas. But I should like to know something about cost. If you are going to assist the Government and local authorities to put the Clean Air Act into proper operation, you have to produce something which the consumer can afford to pay for. I am perfectly convinced that the ideal fuel for consumers is gas and gas alone. I have no solid fuel in my house, although I advocate it. The reason why I advocate it is that unfortunately the greater part of the population must look to the pennies, and they know that what is by far the cheapest flame is the flame they will produce in a modern appliance from solid fuel.

The Cost of Gaseous Fuel

'If we are going to gas, as I am sure Dr. Dent in his heart of hearts would like us to do and, I believe, Mr. Diamond, where are the people going to get the fuel to displace the 38 mill. tons of domestic coal which they are now using for space heating and water heating? Water heating, yes. The general water-heating load can be taken by gas. But if you reduce the price of gas from the present value—I think I am paying 2s. a therm and nearly everyone is paying 1s. 9d. or thereabouts—to 1s. 6d., you are not going to produce anything as cheaply or anything like as solid fuel. That is the position, I think, to which we have come.

'I would also warn the Institution of Gas Engineers how wise they are to introduce industrial gas and gasification into their examination syllabuses. If we are to work in this whole country with about 10 large works, where are the gas engineers going to be?

Dr. Dent, replying said: 'Both Mr. Diamond and Mr. Williams emphasised the importance of the gas quality made by this process. This is the result of pressure on the reaction. In gasification at atmospheric pressure we have been confined to the old reaction $C + H_2O$ gives $CO + H_2$, and we have supplemented that by the cracking of oil by thermal decomposition. Under pressure, as well as the decomposition of steam, we have this hydrogenation reaction, and it is now possible to convert carbon monoxide and remove carbon dioxide, so that with the means now available it is far easier to design a process for a specific product.

'As to organic sulphur, the crude and fuel oils used at Poole produced gas which contained less than two grains of organic sulphur per 100 cu.ft. We did not report this, however, because we realised that our hydrogenated gas at Poole was abnormally low in carbon monoxide, and a gas with even a little higher proportion of carbon monoxide would have given a product of higher organic sulphur content. Nevertheless, we realise that we were not purifying the gas, and during the pressure washes which this gas would be given, the organic sulphur would be reduced further, so it is fairly safe to assume the gas will be low in organic sulphur compounds.'

'Mr. Diamond and Sir Charles Ellis both alluded to the formation of aromatic hydrocarbons. We think there are undoubtedly two mechanisms, either from unsaturated radicals or from the aliphatic constituents which were originally present in the oil, but under normal hydrogenation conditions most of the aromatic hydrocarbons in the condensate are obtained by the second method, since under pressure the unsaturated radicals have far too short a life to provide an effective mechanism. That this can occur, however, is shown by the appreciable yield of benzene we did obtain from light distillate when the rate of formation of the radicals was increased by using a high oil:hydrogen ratio, and might well be a pointer for increasing the aromatic hydrocarbons from light distillate.

'Sir Charles Ellis' question about the four parameters is of very great interest. The chief influence of the gas rate through the vessel is to determine the throughput of the plant in its relation to the chemical reactions occurring, but there is no evidence at all to show that it will have any influence provided the residence time is increased by using a deeper fuel load. A higher gas rate does tend to increase the carry-over from the fluidised bed, but at what gas rate this would become embarrassing I do not know, though it has been found that both carry-over and surging in a fluidised bed can be controlled to a considerable extent by immersing baffles in the bed.

'With the increase in the oil rate, so is the hydrogenation reaction reduced, and there is a greater production of higher aromatic hydrocarbons. With heavy oils one would expect a greater deposition of carbon, but since such products can be returned, it is doubtful whether their formation would in actual fact influence the operating conditions, but there might be an increasing tendency for caking in a fluidised bed, which is important. As the oil rate increases means of preventing agglomeration are made use of and when their limit of effectiveness has been reached, so would the maximum rate of oil injection which in turn determines the maximum calorific value of the gas. Even so, at the maximum oil rate it is possible to recycle the gas for further enrichment.

'Surprisingly enough, the increase in the oil rate did not appear to affect the nitrogen value of the gaseous hydrocarbons, which was very susceptible to temperature changes but very little affected by the fluidised oil and hydrogen.

'Turning to the parameter of temperature, it is clear that as this temperature is increased, hydrogenation becomes more complete, and the N value of the gaseous hydrocarbons diminishes, which causes the reaction to become exothermic. Aromatic hydrocarbons are attacked, but benzene is the last to go. At too high a temperature, however, there is a tendency for soot formation so that for sweet and clean operation we would choose the lowest temperature at which an adequate performance is obtained. We would prefer low temperature and high pressure to high temperature and low pressure, but there is still a great deal of experimental work to be done to explore in this connection.

'Leaks on a pressure pilot plant which is in periodic operation, in use one day and standing idle the next, make it extremely difficult to obtain accurate gas yield by direct measurement. To emphasise this, I might say that there were more than a thousand jumps on the pilot plant at Poole. Rather than measure the gas directly, it was far better to take precautions to measure the carbon and condensate correlation and determine the amount of gas by difference. This we did, and it is on such figures that the potential heat balances are

(Concluded on p. 610)

Preparing a Technical Report

—*continued from p. 597.*

of a technical report, is the advantage which may often accrue to the person making the enquiry.

This is particularly the case when he is dealing with a new problem of a non-routine character. Here, it is by no means an uncommon experience to find that he starts along certain lines which later have to be discarded as wrong approaches. The wider his experience, the less likely will he be to start on the wrong track. The oft-expressed opinion that such 'wrong' beginnings are a waste of time is very often far from the truth, since they form part of the experience gained by the worker, the value of which, though incalculable, is nonetheless real.

As he proceeds with the work, he will find himself accumulating a great deal of information, much of which is not relevant to the original scope of the investigation. It may, nevertheless, have great potential value to him in future work.

Part of the material which is not relevant to the report may, nevertheless, be worth keeping in the investigator's private file. It may, in fact, be looked upon as a kind of 'by-product' of the work, and will form an addition to the 'mental capital' of the worker. It is, therefore, desirable to keep a copy (or the original working notes) of *all* the information, however seemingly irrelevant such information may appear to be at the time. In this connection it must be remembered that, during the course of a prolonged investigation, the investigator will have received a lot of information indirectly, and will have been guided (in some cases almost sub-consciously) by listening to, and taking part in conversations, and by reading accounts of other people's work, and by attending staff conferences. Notes should therefore be preserved of all such matters. Even where these do not bear directly on the subject, they will, in a surprisingly large number of cases, be found invaluable when other problems crop up later.

After the report has been presented, whether publicly, as at a meeting of a technical society, or more privately as when passed on to a senior official, there will be, or should be, a discussion, in which the writer of the report should be invited to take part. By preserving for himself a record of other people's views at such a discussion, he can add still more to his intellectual capital and can benefit by the broadening of his mental outlook.

Recommendations for Mainlaying

THE Pipes Committee of the Institution of Gas Engineers has recently submitted to the Council of the Institution its 'Recommendation on Mainlaying' (Com. 491). This is now available and can be purchased from the Institution on application to the Secretary at 17, Grosvenor Crescent, London, S.W.1, for 2s. post free. This publication is divided into two main sections, part A and part B with a full set of appendices illustrating in detail many of the recommended methods described in the main part of the test.

Part A applies to supervisory personnel, and contains directions on the routing of mains, provision of materials, the inspection of the route, deployment of labour and the final testing of mains together with other relevent points. Part B is applicable to all personnel and is divided up into a number of subsections, such as tools and equipment, preliminary considerations, work preparatory to mainlaying, etc. There are seven appendices which illustrate a number of points in greater detail and cover such items as the use of the globe type boning rod, the use of types of pipe joints, methods of fixing valves, and syphons.

The Pipes Committee was of the opinion that methods of mainlaying practice differed widely throughout the country and was anxious to collect what was considered to be the best practice and publish it in as concise a form as possible. These recommendations are submitted for guidance and the publication should not be looked upon as a manual of instruction.

CAPACITY, 3 MILLION CUBIC FEET

C. & W. WALKER
LIMITED
DONNINGTON
Nr. WELLINGTON
—SHROPSHIRE

'Phone : Wellington-Shropshire 12
'Grams : "Fortress," Donnington-Shropshire

SPIRAL GASHOLDERS
RIVETED OR ELECTRICALLY WELDED

BRITISH MATERIALS
BRITISH LABOUR
HIGHEST QUALITY
IN WORKMANSHIP

MILBOURNE SELF-LUBRICATING ROLLER CARRIAGES

LONDON OFFICE : 70, VICTORIA STREET, S.W.1.
'Phone : Victoria 5842.

The Hydrocarbon Content of Fuel Gases

Discussion on Research Communication GC31 by
A. L. ROBERTS, J. H. TOWLER, and B. H. HOLLAND,
an abstract of which was published on p. 547 last week.

CONTRIBUTIONS BY DR. BURNS, MR. GOODERHAM, MR. RYDER AND DR. DEWHURST

Before Mr. Towler presented the paper, **Professor A. L. Roberts** mentioned one or two points about the background of the work. Some years ago the Joint Research Committee of the Gas Council and the University of Leeds had decided to set up a school of infra-red spectrometry because this technique was so valuable in many directions, particularly as a tool in analysing the components of complex mixtures of organic substances. One useful application was thought to be to the precise analysis of typical fuel gases, with particular respect to the hydrocarbon fraction. This paper summarised the results obtained so far.

'Infra-red spectrometry has been the main tool but you will see that quite extensive separation into groups of components, as well as the use of the older chemical analytical methods, is still needed if complete analyses are to be made. To obtain full advantage from the method, you need fairly expensive equipment, a good deal of skill, experienced operators, and pure samples of the materials with which you are concerned, to make identification and estimation certain. But once established the technique is a powerful aid to research; its help in analysing effluent liquors, for example, has been invaluable.'

Dr. J. Burns (Vice-President), opening the discussion, dealt with the 'more practical aspects' of the hydrocarbon content of fuel gases. 'In our coal and fuel gas we recognise three main types of product—the hydrogen and CO_2 which are the ultimate products and the products of reaction. In the carbonising process we recognise carbon dioxide and nitrogen purely as ballast. Then we recognise the hydrocarbons which we know have to be cossetted and protected, because they are the raw materials; they are the life-blood of the pure gas and at the same time the raw materials which will yield further products.

Protecting the Hydrocarbons

'But how can we protect, how can we alter and make use of the hydrocarbons which are produced in the carbonisation process? How can we alter the amount of their production? In the work done by Dr. Pexton some time ago in the hydrocarbon enrichment field, the conception of the efficiency of carbonisation is set out very clearly—the value of protecting the hydrocarbons. In static carbonisation, for instance, we can protect hydrocarbons by minimising the amount of free space above the charge in the horizontal retort by using machines which will give a completely full charge. Similarly, in the intermittent vertical retort we could again minimise the amount of hydrocarbon destruction by giving a very full charge. In the continuous vertical retort, where the control of hydrocarbon destruction and protection is not so simple, the only method we have is by regulating the throughput together with the gradation of temperature up the retort. Nevertheless, even in the continuous vertical retort we can produce hydrocarbons and protect them to give a final gas of 500 B.Th.U. per cu.ft.

'The coke oven is a very important form of carbonisation, and here we can protect the hydrocarbons not so much by controlling the free space at the top of the furnace but by the control of flue temperature at the top of the charge. The tremendous difference which can be effected in carbonisation by control of these conditions is well known.

'What is the practical application of all this today? The immediate application is the saving of oil, which is most essential at the present moment. By protecting the hydrocarbons produced from coal, we can minimise the amount of oil needed to provide the required amount of gas, by being able to dilute the rich hydrocarbons with indigenous oil and such raw materials as coke; in other words, by a supply of CO_2 and hydrogen. In this connection I would say that by reducing the nitrogen content to an absolute minimum, the maximum amount of oil will be saved.

'Another application of this type of work and the approach shown us by Professor Roberts, is to be able to predetermine the quality of the benzole recovered from any particular gas. This is important, because it is very expensive to put up a full-scale benzole plant in order to find out what type of benzole is contained in a hydrocarbon gas. It is simpler and less expensive to study the nature of the hydrocarbon gases in the gas and determine the type of benzole you can produce therefrom. But although we have made a certain amount of progress in our appreciation of the value of hydrocarbons in coal gas and in coal carbonisation generally, we still have a very long way to go. At this stage we can only roughly control their content in coal carbonisation, but in oil gasification we have hardly begun, and are right on the threshold of hydrocarbon chemistry in this branch of gasification. Though it is perfectly true that oil has been gasified in the water gas plant, our knowledge is still very limited, and of the three main types, thermal cracking, catalytic cracking and the possibility of cracking in the presence of hydrogen, I should like to know why thermal cracking gives a gas of 1,000 B.Th.U. per cu.ft. What are the breakdown procedures from the hydrocarbon to the gaseous? What is the effect of adding a catalyst to that? What is the effect of adding a catalyst and hydrogen to oil in thermal cracking? This gives some indication how far we need to go to complete the study of hydrocarbons and hydrocarbon chemistry.'

Mr. W. J. Gooderham (North Thames Gas Board) said that over 20 years ago he had done somewhat similar analyses, and it was astonishing to note the new analytical tools which had since become available and which the authors had freely used. He had no doubt that if further work was done, they would have to bring in the polarograph, the vapour-phase chromatograph, and the para-magnetic balance to complete a very impressive equipment of scientific tools.

'I only hope that the hard-headed gas engineer will not think that work of this sort is too academic to be of interest to him, but the gum problem in the 1930's showed that what might have seemed insignificant concentrations of nitric oxide were in fact vital to our livelihood. Our industry, too, has made some profit from "insignificant" quantities of germanium and gallium. Similarly, the small concentrations of acetylene referred to in this paper, might well be the controlling factor in preventing further decomposition of precious methane and ethane and the concentrations of other substances, such as butadiene and indene, might well be of the greatest importance.

Preponderance of Methane and Ethylene

'It would appear that there are some remarkable similarities between the results given in this paper and those given in the early papers. There is the same overwhelming predominance of methane and ethylene compared to ethane and propylene respectively, in the products of high temperature carbonisation, and there is the same hyperbolic fall in the concentration of the C_3, C_4 and higher hydrocarbons. We are very fortunate in having so much methane, ethylene and ethane in our carbon gases, and this good fortune can be linked with chemical kinetics. I am sure that one day someone will correlate the concentrations given in this paper with the free energies and equilibria of hydrocarbons undergoing thermal decomposition. When they do, I hope they will not forget to read the work of Professor Lewes at the turn of this century and that of Stephen White in 1850. I have always

found it very chastening, after doing a piece of work I thought was new to read the *Journal of Gas Lighting* of a century ago, in which can be found many very interesting facts and figures.

'The authors suggest that methylcyclohexane might be regarded as a cracking indicator. Naphthalene and the aromatic content were used as similar indicators in the past, and in this I am not so sure that the carbonisation industries were very far from the truth though I have often felt that "ethane" as determined on a constant volume gas analysis apparatus is also a useful guide to the cracking conditions. I would like the authors to add the total yields of condensable substances so that some comparisons may be made with the yields of benzole from various Yorkshire coals and carbonising plant which were given in "Benzole and Toluene from Coal Gas," published by the Stationery Office in 1950.

Coals of Different Origin

'I have always believed that if you look hard enough you can find any volatile substance in coal gas, and I am sure that germanium hydride was present in my gases, so I wondered if the authors noticed anything else in the way of volatile inorganic compounds.'

Mr. C. Ryder (South Eastern Gas Board) wondered whether the authors had carried out any work on gases produced from coals of a different origin, and if so whether their results showed any wide variations from the figures quoted in this report. The authors had noted the apparent discrepancy in the values found for the acetylene content of coal gas as found in coke oven gas and continuous vertical retort gas. Could it be that the combustion chamber temperatures of the coke ovens were lower than was normal?

'I should like to support the authors' figures for acetylene in Segas, using purely chemical techniques, but on a different feedstock, a figure of 0.215% acetylene in Segas was found, compared with the authors' figure of 0.275%. However, an analysis on mixed gas from the East Greenwich works carbonising Durham coals gave the figure of 0.032% as compared with the authors' figures of 0.053% for coke oven gas and 0.072% for C.W.G.

Organic Sulphur

'Referring to the organic sulphur in Segas, tests have been carried out on the York Segas plant by our laboratory staff, and while agreement was obtained with the figure quoted for thiophen, a value of ten times as great as the figure quoted in this paper was found for carbon disulphide. Similarly, with respect to coal gas produced in horizontal retorts and coke ovens, works figures for carbon disulphide contents are about twice the figures quoted, whereas the figures for carbon oxysulphide are much lower than those quoted. Could it be that all the carbon disulphide present in the gas is not collected by the means outlined in this paper and the slip is included in the figure for carbon oxysulphide?'

Dr. J. R. Dewhurst (South Eastern Gas Board): 'We have done work on the odour of town gas, and one of the things which has surprised me is the powerful nature or high smell of coal gas itself. When one considers that the odour of gas is probably due to only a fraction of the unsaturated compounds, it is at once clear that the material that actually has the smell of coal gas must have a very intense smell indeed. This detailed analysis of the hydrocarbons should help us to trace which compounds are the ones that are smelly, so that in work designed to increase the odour of town gas we should know which compounds should be added if we want to continue to have the same type of smell although increasing it.

Aromatic Contents of Tars

'We know that the tars derived from horizontal retorts are more aromatic than the tars derived from vertical retorts, and those in their turn are more aromatic than the tars derived from low temperature carbonisation. This agrees with the results reported. The proportions of aromatics and the proportions of unsaturated and paraffinic hydrocarbons are in like order of the carbonisation conditions. But there is another property which goes with those carbonising conditions. The phenol content of the tars increases as the cracking conditions are reduced, or I suppose phenol content is reduced as cracking conditions are increased, to put it more precisely. This implies that the tars from high-temperature conditions contain less oxygen than the tars from low-temperature conditions.

'The authors have condensed out and extracted practically everything in these gases except the hydrogen and CO_2 and one or two odds and ends of nitrogen. They have analysed their condensate and found a lot of unsaturated and saturated hydrocarbons. But there is no reference to any oxygen content except the carbon oxysulphide and they have only got that by difference. Are there no ethers, ketones or alcohols? One would have expected some even if it were only small traces.'

Oil Cracking

Mr. Towler, replying, said: 'Referring to the mechanism of the cracking of oils, one of the next projects in our laboratory will be an examination of this very problem, with particular reference to the Segas type of plant. We are aware of Mr. Gooderham's early work, and we appreciated it very much, but he will be the first to admit the limitations of the method he used. We are, however, indebted to him for a piece of apparatus which we adapted.

'I would agree that ethane, or the carbon density of the paraffin hydrocarbons, as determined by Bone and Wheeler, is a good indication of cracking and so is the naphthalene content. We have not observed any volatile metallic compounds at all, though if they had been in the lower concentrations we should probably have spotted them, since they usually have very definite spectra.

'In reply to Mr. Ryder, who asks whether we have analysed gas from any coals other than Yorkshire, I would say that the only other coal has been a Derbyshire coal, which we cannot say very much about because it was carbonised under low-temperature conditions so that naturally the results are not comparable. Referring to coke oven gas, he suggests that the temperature might be lower than we reported. Far from it. I would say, from the appearance of the flue and the very high naphthalene content of the gas, that the temperature was probably about 100% higher than the temperatures recorded in the paper.

'As to sulphur in Segas, we did not set out specifically to look for this, but there is a very fine piece of work by Wood, who investigated practically every type of gas made or thought of, and this is all expressed very nicely in the 1951 report of the General Research Committee. I do not think that we can improve on it.

Odour of Gas

'I believe some of the low sulphur figures might be attributed to absorption of CS_2. Some work has been done in Germany but I have no exact information. Dr. Dewhurst referred to the odour of gas. Though 1:3 butadiene has been suggested as an additive for gases, I cannot quite see what advantage is gained, as it is one of those things that tend to polymerise, oxidise and give trouble all round. So that I do not know how to balance one disadvantage against the other. The gas after the removal of all the unsaturated constituents has no odour whatever, nor has it any luminosity. I would add one more oxygen compound to those noted, 1:2 benzofuran, since oxygen compounds have definite spectra, and we could hardly miss them, nor would we miss CO compounds because they absorb in a convenient region of the spectrum where there is much less absorption.'

HYDROGENATION—(Concluded from p. 607)

based; and so in the potential heat balances there is no missing carbon or hydrogen. The values deduced for the heats of reaction therefore are fairly accurate, but they vary and there are reasons why they should vary.

'First, because, as the nitrogen value of the gaseous hydrocarbons goes down, so the heat of the reaction increases, secondly, as the yield of aromatic hydrocarbons increases so the heat of reaction will go down, and thirdly, because, as the formation of carbon increases the heat of reaction goes down due to the formation of carbon being endothermic.'

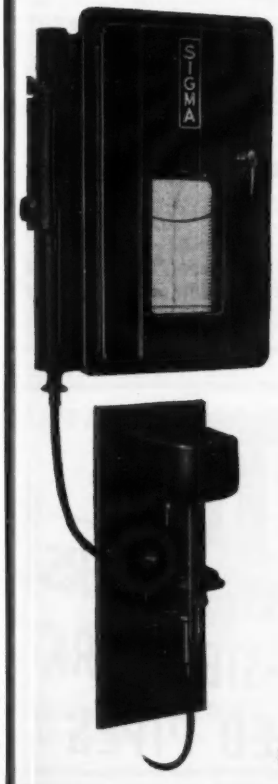
Gunite and Cementation
Systematic repairs to structures based on systematic diagnosis of defects
WHITLEY MORAN & CO, LTD
5 OLD HALL STREET • LIVERPOOL 3
Telephone: CENtral 7975
SPECIALISTS IN THE REPAIR OF ENGINEERING STRUCTURES

CASES FOR BINDING
Quarterly Volumes of the 'Gas Journal'
7/6 each, post free
Walter King, Ltd., 11, Bolt Court, Fleet Street, London, E.C.4.

GAS METER CRANKS
Telephone: DUNSTABLE 90
The Clifford Engineering Co., Ltd.
Dunstable, Beds.
Specialists for over 35 years
Single and double throw cranks for all meter

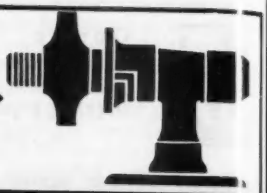
EWART CHAINBELT CO., LTD.
DERBY, ENGLAND
Driving and Conveyor Chains of the best quality; made of Ley's Celebrated Blackheart Malleable Iron.
ALSO COMPLETE CONVEYORS AND ELEVATORS

POINTER
FOR
PLANT HIRE
Excavators
Concrete Mixers Trenchers Bulldozers
Scrapers Rollers Dumpers
Loaders Compressors Pumps
Traffic Signals, etc.
Estimates for Bulk Excavations
HARRY POINTER (NORWICH) LTD.
Guardian Road - - - Norwich
Telephone: Norwich 24104



SIGMA INTRODUCES THE WORLD'S FIRST RECORDER OF
WOBBE INDEX
$$K = \frac{C.V.}{\sqrt{SP.\ GR.}}$$
It is appreciated that complete control of calorific value alone does not answer all consumers' problems regarding efficiency of appliances. By recording and, if necessary, by providing apparatus to control Wobbe Index we can help you overcome them.
PLEASE ASK FOR FULL DETAILS
SIGMA—MAKERS OF BRITISH PRECISION INSTRUMENTS FOR THE GAS AND ALLIED INDUSTRIES
SIGMA INSTRUMENT COMPANY LIMITED
SPRING ROAD • LETCHWORTH • HERTS •
'Phone: Letchworth 1845 (3 lines) 'Grams: Sigma, Letchworth.

QUALITY BRASSWORK
for the GAS INDUSTRY



WILLIAM EDGAR & SON LTD
BLENHEIM WORKS, HAMMERSMITH, W.6

GAS RETORTS

HARRIS & PEARSON LTD
STOURBRIDGE. ENGLAND.

INSULATING BRICKS. RECUPERATOR TUBES. SPECIAL SEMI-SILICA QUALITY FOR SEGMENTAL RETORTS WITH NO EXPANSION OR CONTRACTION AT 1400° C

Manufacturers of
Fire Bricks, Lumps & Tiles
OF EVERY DESCRIPTION

COAL AND COKE SCREENING & SIZING PLANTS.

RETORT SETTINGS PRODUCERS. FURNACES REPAIRS.

GOODALL, CLAYTON & Co. LTD.
LEEDS.

CONVEYORS, ELEVATORS, BUNKERS, ROOFS, HOISTS, Etc.

WESTWOOD & WRIGHTS
LIMITED

BRIERLEY HILL, STAFFS.

GASHOLDERS · PURIFIERS · WASHERS
CONDENSERS · CASTINGS · STEELWORK
GAS VALVES · WELDED PIPES

PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/6d.; by post 1/8d.

Subscription Rates:—65/- per annum; (Payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 2/6 per line (approx. 7 words)—minimum charge 10/-. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10 in. deep × 7 in. wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

NORTHERN MANAGER: Philip W. B. King, Flat 1, 7 Langcliffe Avenue, Harrogate. *Telephone:* Harrogate 67625.

SOUTHERN & MIDLANDS REPRESENTATIVE: A. Engelhardt, T.D., 11, Bolt Court, Fleet Street, E.C.4. *Telephone:* Fleet Street 2236-7.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: FLEet Street 2236-7. *Telegrams:* Gasking, Fleet, London.

OXIDE

DUTCH AND DANISH BOG ORE
SPECIALLY ACTIVATED OXIDE OF IRON

Oxide supplied on loan or sale outright.
Highest prices paid for Spent Oxide.

Send your enquiries to

AS PURIFICATION LIMITED

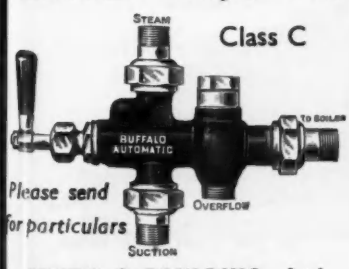
PALMERSTON HOUSE, BISHOPSGATE, LONDON, E.C.2.

...grams: ...rification, Stock, London." Telephone: London Wall 7938/9 & 7930

The
LIMIT OF EFFICIENCY CAN BE REACHED
by the use of
LUX
GAS PURIFYING MATERIAL

Sole Importers:
HARRISONS (London) LIMITED
66, Mark Lane, LONDON, E.C.3
Telegrams: Birchrock, London *Telephone:* ROYal 3128

BUFFALO INJECTORS



Please send for particulars

GREEN & BOULDING, Ltd.
162a Dalston Lane, London, E.8

"KLEENOFF" ★
THE COOKER CLEANER

"KLEENOFF"
FIBRE BRUSHES
RUBBER MOPS

"KAY-DEE" ★
KETTLE DESCALER

for resale to the public and in bulk for works use

BALE & CHURCH, LTD.
7 CROMPTON WAY, CRAWLEY, SUSSEX

PLANT FOR SALE

FOR SALE: 30' × 8' 6" dia. Pressure Vessels (ex Lancashire Boilers ceased working at 150 lbs. W.P.). Cleckheaton Engineering Co., Ltd., Cleckheaton. 'Phone 397.

FOR SALE: Unused " AUDCO " Lubricated Valves. 9—8" fig. K.G. 33; 17—6" L.W. 23; 2—6" fig. M.G.21F.; 9—4" M.W. 21F; 19—2" fig. 2,400 (Sulphate Resistant); 16—4" fig. M.W.11; 13—¾" M.W. 12 (screwed); 15—6" A.3W. 3 way; 6—3" M.T.11; 6—4" MU.11F. 4 way; 11—3" M.L.11. Cleckheaton Engineering Co., Ltd., Cleckheaton. 'Phone 397.

APPOINTMENTS VACANT

EASTERN GAS BOARD

NORWICH DIVISION
ASSISTANT WORKS CHEMIST—NORWICH

APPLICATIONS are invited for the appointment of Assistant Works Chemist at the St. Martin-at-Palace Works, Norwich.

Candidates must have had experience in a fuel industry and must show that they have obtained, or are progressing towards, an approved qualification in chemistry.

The commencing salary will be within the range £575 to £690 per annum (Grades 5 to 6, A.P.T., Provincial 'A').

A flat will be available soon at a reasonable rental if required.

The successful candidate may be required to pass a medical examination, and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme within six months of taking up the appointment.

Applications, giving details of the candidate's qualifications and experience, and the names of two referees, must be received by the Manager, Norwich Group, Eastern Gas Board, Bishop Bridge, Norwich, within a fortnight of the appearance of this advertisement.

November 22, 1956.

EASTERN GAS BOARD

NORWICH DIVISION
WORKS DRAUGHTSMAN—NORWICH

APPLICATIONS are invited for the appointment of Works Draughtsman at St. Martin-at-Palace Works, Norwich.

Candidates must have had their training and/or experience in the Gas Industry or an allied industry, and must show that they have obtained, or are progressing towards, an approved engineering qualification.

The commencing salary will be within the range £575 to £690 per annum (Grades 5 to 6, A.P.T., Provincial 'A').

A flat will be available soon at a reasonable rental if required.

The successful candidate may be required to pass a medical examination, and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme within six months of taking up the appointment.

Applications, giving details of the candidate's qualifications and experience, and the names of two referees, must be received by the Manager, Norwich Group, Eastern Gas Board, Bishop Bridge, Norwich, within a fortnight of the appearance of this advertisement.

November 22, 1956.

DEMONSTRATOR/HOME SERVICE ADVISOR

R. & A. MAIN, LTD., Domestic Appliance Manufacturers, require the services of a first class DEMONSTRATOR. Minimum age 25. The post offered is permanent and will involve travelling.

Applicants must have qualifications in domestic science, be accustomed to demonstrating before large audiences, and possess personality and tact. An attractive salary will be paid to the successful applicant.

Applications giving full details as to age, experience qualifications and present salary should be addressed to the Personnel Manager, R. & A. Main, Ltd., Gothic Works, Angel Road, Edmonton, N.18.

KARACHI GAS COMPANY

PAKISTAN
INSTRUMENT FITTER

THE above Company, which distributes natural gas in the Federal Area of Karachi, requires an INSTRUMENT FITTER.

The successful candidate will be responsible for the operation and maintenance of all types of pressure regulation and flow measurement equipment and instruments used in the gas distribution system. A general background of gas distribution practice will be of advantage.

The appointment will be on the basis of an initial three year contract and the nett salary, after deduction of tax, will be of the order of Rs. 1,850 per month (approximately £1,675 p.a.). Free accommodation will be provided, which, after a qualifying period, will include for family.

Applications stating age, qualifications, experience and the names of two referees should be addressed to the Personnel Manager, D. & C. and William Press, Ltd., Twenty Albert Embankment, London, S.E.11, to arrive within two weeks of the appearance of this advertisement.

(*Classified advertisements continued on page* 614)

APPOINTMENTS VACANT (*ctd.*)

**R. & J. DEMPSTER, LIMITED,
NEWTON HEATH,
MANCHESTER 10.**

APPOINTMENT OF CHIEF DRAUGHTSMAN

THIS old-established firm of gas and chemical engineers require the services of a CHIEF DRAUGHTSMAN with a view to his ultimate appointment of Chief Engineer.

Applicants must have had experience in the gas industry and a knowledge of associated chemical plant and will be required to take charge of staff dealing with design, estimating and detail work. Membership of recognised technical institutes would be advantageous.

This important pensionable appointment will carry appropriate remuneration and assistance will, if required, be given towards finding suitable accommodation.

Apply stating age, full particulars of experience and present salary to The Secretary, Manchester.

NORTH WESTERN GAS BOARD

SOUTH LANCASHIRE GROUP
SENIOR TECHNICAL ASSISTANT (PRODUCTION)—WARRINGTON WORKS

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T. 10 (£820/£920 p.a.).

The successful applicant, who will be responsible to the Station Engineer, will assist the Works Superintendent in the operation of the Works (daily capacity—Vertical Retorts 10 mill. cu.ft.; C.W.G. 6 mill. cu.ft.). Applicants should possess a Higher Grade Certificate in Gas Engineering (Manufacture) of the Institution of Gas Engineers or an equivalent qualification.

Detailed applications, giving the names of two referees, should reach the General Manager, N.W.G.B., South Lancashire Group, Radiant House, Cotham Street, St. Helens, within 14 days.

SCOTTISH GAS BOARD

WESTERN GROUP
PAISLEY DISTRICT
APPOINTMENT OF SENIOR TECHNICAL ASSISTANT

APPLICATIONS are invited for the position of SENIOR TECHNICAL ASSISTANT at the Paisley Works of the Scottish Gas Board.

Duties will include the technical control of Continuous Vertical Retorts, Carburetted Water Gas Manufacture and Works Laboratory Practice.

The Salary will be in accordance with Grade 7 (£670/£750 per annum) Provincial 'A' of the National Salary Scales, with placing according to experience and qualifications.

The position is pensionable, and the successful applicant will be required to pass a medical examination.

A rented house is available if required.

Applications stating age, and giving particulars of education, training, experience and qualifications, should be addressed to the District Manager, 27, McKenzie Street, Paisley, to arrive not later than Monday, December 17, 1956.

SENIOR DRAUGHTSMEN with sound mechanical training required by Dust Control Engineers and Fan Manufacturers. Experience of this type of work is not necessary, but good general training and experience in plate work is desirable. Higher National Certificate desirable. Opportunity also exists for suitable applicants to train as Dust Control Engineers. Write AIR CONTROL INSTALLATIONS LTD., Victoria Road, Ruislip, Middlesex.

WALES GAS BOARD

SALES AND SHOWROOM MANAGER—RHYL UNDERTAKING

APPLICATIONS are invited for the above Appointment.

Candidates should be fully experienced in all aspects of Domestic and Commercial Gas Sales, including Showroom Management, Publicity, Sales Campaigns, District Canvassing, Home Service Work and dealing with consumer complaints. The person appointed will be required to maintain close liaison with Local Authorities, Architects and Builders in the area. Possession of the I.G.E. Certificate in Gas Salesmanship and Consumer Service (or equivalent qualification) will be an advantage.

The salary for the post will be in accordance with Grade A.P.T. 5 (Provincial 'A') (£575/£655) of the National Salary Scale for Gas Staffs, with placing according to experience and qualifications. The post is pensionable.

The successful applicant may be required to pass a medical examination.

Applications, stating age, particulars of training, qualifications and experience, together with the names of two referees, should be addressed to the undersigned not later than Monday, January 7, 1957.

O. P. CRONSHAW,
Engineer and Manager.

Gas Offices,
93, Wellington Road,
Rhyl.

SOUTH EASTERN GAS BOARD

ELECTRICAL ENGINEERING ASSISTANT, EAST GREENWICH
METROPOLITAN DIVISION

AN Electrical Engineering Assistant is required for the Board's East Greenwich Works to assist the Electrical Superintendent in operational control and supervision of plant installation and maintenance at the Station.

The East Greenwich site covers a large area and there is an extensive extra high tension and medium voltage distribution system with associated substation equipment. Alternating current motors are extensively used and there is Mercury-arc rectifier equipment with D.C. motors for certain special duties. Power is supplied from a power station with an installed capacity of 6,500 kW equipped with condensing and pass-out steam turbo-alternator sets.

Applicants should therefore have practical industrial experience and technical knowledge in the installation and maintenance of such equipment on a large scale.

Possession of a Higher National Certificate or equivalent qualification in Electrical Engineering is desirable.

Salary within Grade 10 (Met. Area)—£850-£950 p.a.

Applications in writing, quoting reference V10/743 and giving full details should reach the undersigned within ten days.

R. J. MCCRAE,
Personnel Manager.

Katharine Street,
Croydon.

WEST MIDLANDS GAS BOARD

BIRMINGHAM AND DISTRICT DIVISION
DIVISIONAL ENGINEER'S OFFICE

CANDIDATES should hold a Higher National Certificate in Civil or Mechanical Engineering or equivalent qualification, and have had considerable experience in an Engineering Drawing Office, including plant layout; a knowledge of Gas Works Plant will be an advantage, but is not essential.

The salary will be within A.P.T. Grade 9 (£755-£855 per annum) of the National Salary Scales for Gas Staffs. The posts are pensionable and the successful candidates may be required to pass medical examinations. Applications stating age, experience and qualifications, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Gas Offices, Edmund Street, Birmingham, 3, to reach him by December 10, 1956.

J. C. INGRAM,
Secretary to the Board.

NATIONAL COAL BOARD

EAST MIDLANDS DIVISION CARBONISATION DEPARTMENT

A VACANY exists for a SCIENTIST Grade II (£925 x £35—£1,300) to take charge of the Avenue Carbonisation and Chemical Plant Laboratory.

Applicants should possess Hons. B.Sc. or A.R.I.C. or equivalent qualifications and should have had experience in carbonisation, benzole refining and tar products. Experience in sulphuric acid manufacture will be an advantage.

Applications (quoting C.S.V. 50) should be sent to the Administrative Officer, P.O. Box 16, Chesterfield, by January 15, 1957.

NATIONAL COAL BOARD, East Midlands Division, invite applications for the post of Assistant Manager of the Sulphuric Acid and Sulphate of Ammonia Units at the Avenue Carbonisation Plant. (S.V. 669.)

The post also carries responsibilities for Effluent Treatment and Gas Purifiers.

The Acid plant is a 50 ton a day unit and the Sulphate plant a standard indirect unit. The gas purification towers are 27 million cubic feet per day and the effluent plant a Permutit-Woodall Duckham Unit.

Applicants should preferably have recognised academic qualifications in chemistry or chemical engineering, together with operating experience in plants of this type.

A vacancy also exists for an Assistant Manager at the Grassmoor Coke Oven Plant. (S.V.670.)

Applicants should have some practical knowledge of coking plants and experience of controlling personnel.

The salary for both posts will be in the range of £825 to £1,250 according to qualifications and experience.

Applications, giving full details of qualifications and experience with names of referees, should be addressed to the Staff Director, National Coal Board, East Midlands Division, Sherwood Lodge, Arnold, Notts, within seven days.

Please quote the appropriate S.V. reference.

W. C. HOLMES & CO., LTD., Engineers, Huddersfield, have vacancies on their staff as follows:

1. CHEMICAL ENGINEER, holding a degree in chemistry, gas or chemical engineering, or associate membership of the Institution of Chemical Engineers, preferably with some experience in research work on laboratory or pilot plant scale.

2. RESEARCH CHEMIST, preferably holding a degree in chemistry or associate-ship of the Royal Institute of Chemistry.

3. TECHNICAL ASSISTANT, with experience in the testing, operation and control of chemical coal by-product plant. Chemical or gas engineering qualifications would be an advantage.

Posts 1 and 3 will involve some travelling; the Research Chemist will be located in the Research Department at Cleckheaton, near Leeds. Graded salary scheme depending on age, qualifications, and experience. Pension and insurance scheme. Applications giving full details to Mr. J. J. Priestley, W. C. Holmes & Co., Research and Development Department, Whitechapel Road, Cleckheaton, Yorkshire.

MANUAL OF GAS FITTING

R. N. LE FEVRE,
M.Inst.Gas E., A.M.I.Mech. E.

Completely covers the theory and practice of Gas Installation Work and the Servicing of Appliances and Equipment – a possession essential for Students, Sales and Service, Distribution and Fittings Personnel.

Crown 8vo. - 895 pages
666 illustrations

Price **35/-** *inc. postage*

★

DOMESTIC UTILIZATION OF GAS

NORMAN S. SMITH AND
R. N. LE FEVRE

For those on the 'Supply' side and Students of the courses which comprise the Gas Education Scheme.

Crown 4to - 138 pages
155 diagrams

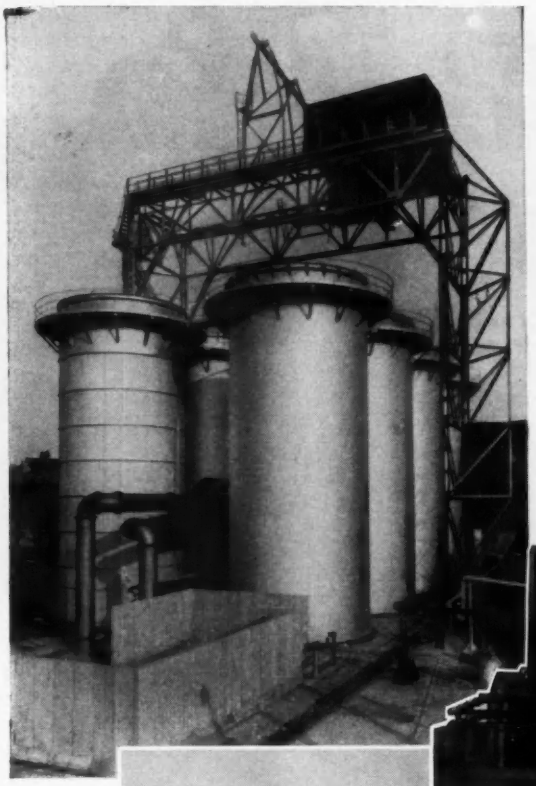
Price **20/-** *inc. postage*

★

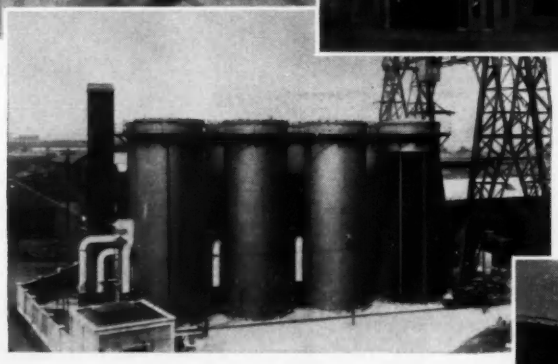
WALTER KING LTD.,

11, Bolt Court, Fleet Street,

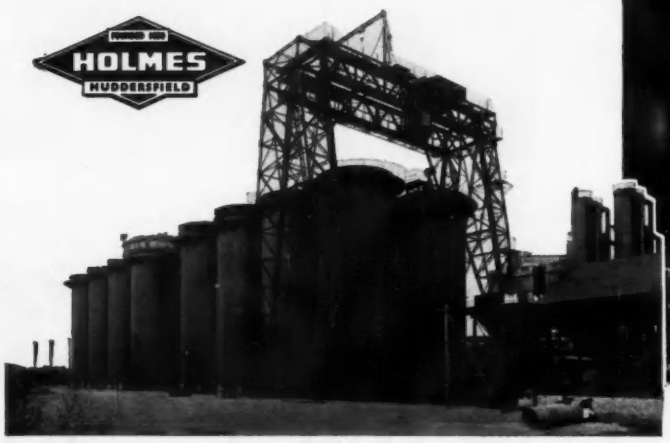
London, E.C.4.



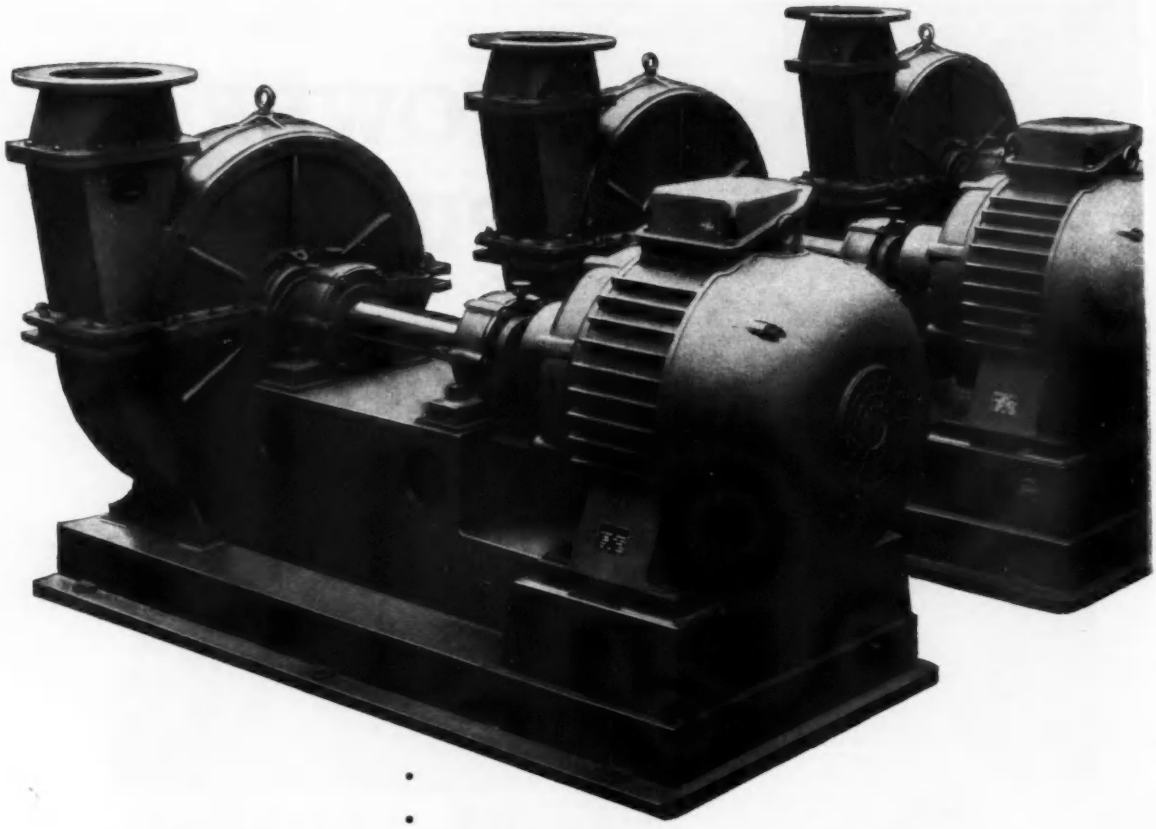
TOWER PURIFIERS by HOLMES



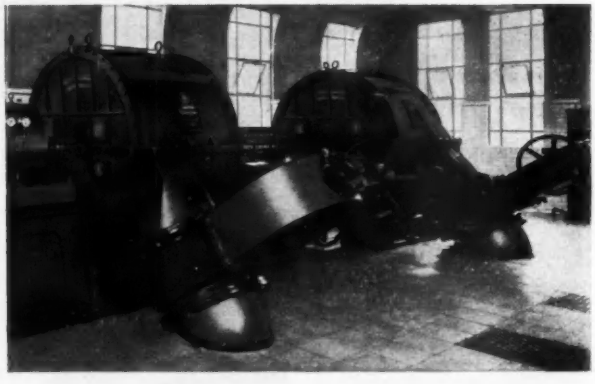
HOLMES HUDDERSFIELD



W. C. HOLMES & CO. LTD · TURNBRIDGE · HUDDERSFIELD



Gas Boosters?



EXAMPLES of gas boosting fans with cast iron casings are illustrated here. They represent the results of special attention to the design and development of robust, trouble-free boosters over the years. This experience provides fans for handling volumes of 5,000 to 1½ million cubic feet of gas per hour at pressures up to several pounds per square inch.
When the time comes you'll find there's no easier way to solve your air or gas moving problem than to put it to Keith Blackman

contact **Keith Blackman Ltd**
MILL MEAD ROAD · LONDON · N17 · TOTtenham 4522

T.A.7225/6

Registered as a Newspaper. Printed by STRAKER BROTHERS LTD., E.C.2 for WALTER KING LIMITED, 11, BOLT COURT, FLEET ST., LONDON, E.C.4., Wednesday, Dec. 5, 1956

A NEW FACTOR IN COKE GRADING

High screening capacity per sq. ft

Freedom from vibration in supporting structure

Low headroom

Low power requirement

Gentle treatment of material

FLÄMRICH RESONANCE SCREENS

Designed and manufactured in the U.K. by :—

WEST'S

WEST'S GAS IMPROVEMENT COMPANY LIMITED

Albion Ironworks, Miles Platting, Manchester, 10

Telephone : COLlyhurst 2961. Telegrams : Stoker, Manchester

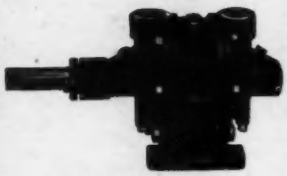
LONDON : COLUMBIA HOUSE, ALDWYCH, W.C.2. Tel.: HOLborn 4108

C.O.L. DIV.: CHANDOS HOUSE, BUCKINGHAM GATE, S.W.1. Tel.: ABBey 6912

F1

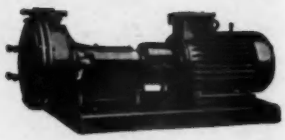
PUMPS AND FILTERS

Filtration Plant

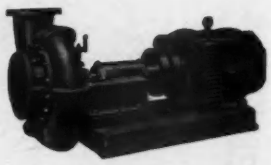


Rotary pump for Oil transfer duties

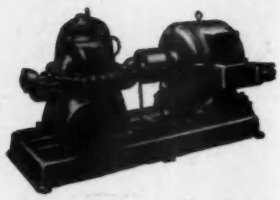
FOR ALL GAS AND ALLIED INDUSTRIES



Stoneware pump for Corrosive and chemicals



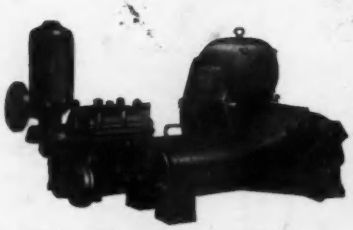
Slurry pump for coal washing and abrasive liquids.



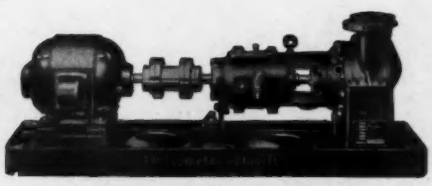
"HS" Type—for water services. All heads up to 500 feet.

"JA" & "JB" types for high temperature water circulation.

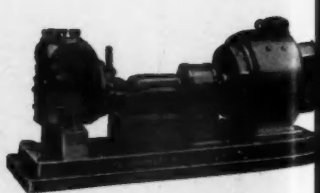
The illustrations show centrifugal pumps for light and heavy oil and liquor duties, stoneware and special metal pumps for handling acids and alkalis, pumps for circulating and washer duties, for clean water and fire services and for liquids containing abrasives.



Reciprocating pump of modern design for Gas Works.



Pulsometer—Pacific type, based on latest American practice.



Self priming centrifugal pumps.

ADVERTISEMENT NO. 3436.

Pulsometer Engineering C° Ltd
Nine Elms Ironworks, Reading. Tel: 67182/5

in association with

Joseph Evans & Sons Ltd
Culwell Works, Wolverhampton. Tel: 20864/6

LONDON OFFICE:
39, VICTORIA ST., WESTMINSTER, S.W.1.
TELEPHONE: 4565 ABBEY.

BRANCHES: **BIRMINGHAM · CARDIFF · GLASGOW · LEEDS · MANCHESTER · NEWCASTLE-ON-TYNE**